DOCUMENT RESUME

ED 321 410 EA 022 070

AUTHOR	Nishi, Shannon
TITLE	Class Size: The Issue for Policy Makers in the State of Utah.
INSTITUTION	Utah State Office of Education, Salt Lake City.
PUB DATE	Jan 90
NOTE	90p.
PUB TYPE	Reports - Evaluative/Feasibility (142) -- Information Analyses (070) -- Reference Materials - Bibliographies (131)
EDRS PRICE	MF01/PC04 Plus Postage.
DESCRIPTORS	Academic Achievement; Classroom Environment; *Class Size; Elementary Secondary Education; Enrollment; Enrollment Trends; *Meta Analysis; School Demography; Teacher Morale; *Teacher Student Ratio
IDENTIFIERS	*Utah

ABSTRACT

A review of literature on class size is the purpose of this report. Included are a summary of four meta analyses (Robinson and Wittebols 1986), (Cone 1978), and (Glass and Smith 1978 and 1979); a discussion of research methodologies; recommendations for policy makers; and alternative strategies for class size reduction. Appendices present information on the relationship between achievement and class size, cluster analysis summaries, Utah demographics, and a set of bibliographies that contain more than 350 entries. (LMI)

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Class Size:
The Issue for Policy Makers in the State of Utah

Prepared for Members of the
Coalition Committee on Class Size

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January, 1990

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January 25, 1990

To Members of the Coalition Committee on Class Size:

As part of my assignment as administrative intern to the Research and Development Division of the Utah State Office of Education, I have been asked to sift through the research on class size and student achievement for the purpose of distilling and reporting the essence of the literature which is currently available.

In the pages which follow, you will find what is, in my opinion, among the most basic yet significant information regarding class size and student achievement for you as a leader and decision maker. I have included general information on class size, an overview of major summaries of class size research, a brief comment on research methodologies, a discussion of the class size issue in our state, implications for policy makers, and alternative strategies for class size reductions.

An appendix is included which contains many useful and interesting tables and graphs. You will also find a bibliography of articles, reports, and books which address the topic. These resources may be found, for more in depth study, in the State Office of Education Research Library.

I believe that this compilation of data may be helpful to you in your personal study on class size and as you participate as a member of the Coalition Committee on Class Size. I have learned a great deal but I am by no means a specialist on class size. My placement at the State Office is now over, but I do hope that you will keep me in mind and feel free to call upon me if I can help you locate additional resources.

Cordially,

Shannon E. Nishi

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General Information on Class Size

The issue of class size, traced as far back as the days of Ancient Greece, seems to have always been a topic of discussion and disagreement. It wasn't until the 19th century though, that this debate really started to intensify and gain widespread attention.

In the mid-1800s a number of social reforms were taking place. Among them was the establishment of a system of public schools. Even though the nation at that time was largely rural, enrollments saw tremendous growth. Less that a century after public schools were first created, nearly seventy-five percent of the nation's children were enrolled. Costs increased as enrollments increased, leaving school officials with the challenge of finding more efficient ways of managing the system.

The United States began the 1980s with a public schools budget of about $150 billion. Roughly 85% of the net cost of education today goes to teachers' salaries. The number of teachers, teachers' salary, and class size are all determined from the following simple equation:

$$\text{Number of teachers} = \frac{\text{Number of Pupils}}{\text{Class Size}}$$

Little can be done to change the number of students that a given school must serve. This is based largely on birth rates and migration patterns. When the number of students served is fixed, the only variables are class size and number of teachers.

Pupil-teacher ratio is very unevenly distributed around the world. Although individual classroom ratios vary within countries, the averages are quite revealing. Figures range from 9.5 students per teacher in Denmark and Norway, to 55 pupils per teacher in Bangladesh. Northern Europe shows small ratios; Central and South America, the Middle East, Asia, and Africa average roughly 35 pupils per teacher.

Pupil-teacher ratio has been falling in nearly every industrialized nation since 1900. In 1900, the typical class in the US had over 35 students. By 1975 class size dropped by 40% across the nation to 21 students.

Meanwhile, here in the Beehive State, school enrollments have been steadily increasing. Over just the last ten years (1978-88), public school enrollments have risen by 32% to a total of 429,551. This puts our state at a distinct disadvantage as we attempt to keep pace with other states.

Although *enrollments* have risen steadily, the average class size in Utah has remained fairly constant. In 1973-74, there was an average of 24.9 pupils for every regular classroom teacher in the state. This same ratio, more or less, has been maintained over the last fifteen years. (see Appendix C)

Class Size Studies: What the Literature Has to Say

Class size studies, like Ming vases, are clustered in dynasties or eras. Although research of sorts has been conducted throughout time, the modern era of class size research is generally recognized to have begun about 1950. No one knows exactly how many studies have been conducted on the topic of class size, but it would be reasonable to approximate numbers in the hundreds.

Most educators would find it cumbersome if not impossible to find and familiarize themselves with each of these studies individually. At times like this it is prudent to utilize the major reviews and commentaries available. Because class size has been so widely researched, the topic has been widely published, debated, and discussed.

Of all the reviews of class size, three are most often cited because of the extensive nature of their bibliographic searches. These are: The 1978 Educational Research Service (ERS) publication *Class Size: A Summary of Research,* A Meta-analysis by Cone (1978); "The Effects of Class Size on Student Outcome Variables: A Review and Synthesis"; and two meta-analyses by Glass and Smith: *Meta-Analysis of Research on the Relationship of Class Size and Achievement* or Meta-Analysis I (1978); and *Relationship of Class-Size to Classroom Processes, Teacher Satisfaction, and Pupil Affect: A Meta-Analysis*, or Meta-Analysis II (1979).

The Glass and Smith and Cone studies, as meta-analyses, represented an attempt to review the research statistically as opposed to the descriptive summaries used in most traditional reviews of the literature A meta-analysis is a kind of statistical treatment in which the authors assign numeric scores to the findings of certain class size studies dealing with the effects of class size on pupil achievement, so that they can present the results of the studies in a single curve. It is a method of research integration; it is not original, experimental research. The Cone meta-analysis showed an effect size of .14, the Glass and Smith study, .38.

SUMMARY OF META-ANALYSIS I

This meta-analysis was based primarily on a graph developed from the findings of 14 class size studies which the authors said exercised good experimental control (see Appendices A and K), Glass and Smith declared that their analysis "established clearly that reduced class-size can be expected to produce increased academic achievement." Ten months later, Glass and Smith released *Relationship* *of Class-Size to Classroom Processes, Teacher Satisfaction and Pupil Affect: A Meta-Analysis* as a "companion piece" to their first report.

Glass and Smith noted a number of problems with previous reviews of class size literature. These included concerns that: 1) searches were haphazard and overly selective; dissertations were avoided and large archives of pertinent data were not sought out, 2) reviews were narrative and broadly treated, and 3) mistakes were made in quantitative methods of reviewing.

76 studies were collected on the relationship between class size and student achievement. These yielded 725 comparisons (or deltas) between smaller and larger classes. These comparisons were integrated into a single curve showing the relationship between class size and pupil achievement. "This curve," said Glass and Smith, "revealed a definite inverse relationship between class size and pupil learning." When other circumstances were analyzed, "virtually none . . . altered the basic relationship; not grade level, nor subject taught, nor ability of pupils." "The major benefits from reduced class size," Glass and Smith found, "are obtained as size is reduced below 20 pupils."

Major conclusions drawn from Meta-Analysis I were that:

1) "A clear and strong relationship between class size and achievement has emerged. There is little doubt that, other things equal, more is learned in smaller classes."
2) Class size and achievement effects were consistently stronger in secondary grades than in elementary grades.
3) Differences in the relationship between class size and achievement were found depending on whether or not pupil assignment was random or controlled.
4) The relationship between class size and achievement was not affected by pupil IQ or different school subjects.

SUMMARY OF META-ANALYSIS II

Relationship of Class-Size to Classroom Processes, Teacher Satisfaction and Pupil Affect: A Meta Analysis (or Meta-Analysis II) examined the effects of class size on non-achievement measures. The same methodologies and procedures were used in both Glass studies.

Meta-Analysis II used 60 studies which yielded 371 comparisons (or deltas). In this second research integration:

- 60% of the comparisons were drawn from studies dating 1965-1969, with 40% from studies between 1970-1978. 25% of comparisons came fron studies dated 1975 -1979.

- 60% of comparisons came from all day self-contained classrooms. 11% were social studies classrooms, 4.3% were drawn from classes in reading, math, language, English or writing.
- The range for "small" classes was from 1-78 with a mean of 20. For "large" classes, the range was from 4-189 with a mean of 45.
- If no information was provided by the researcher (which was typically the case) pupil ability was estimated as average. This resulted in insufficient variation to detect different levels of pupil ability.
- The assignment of pupils to classes was "uncontrolled" in 61% of all comparisons, "random" in 16% of the deltas, and "matched" in six percent of the comparisons.

Meta-analysis II determined three categories of non-achievement effects on class size: affective effects on pupils, effects on teachers, and effects on the instructional environments and processes. The major conclusions drawn from Meta-Analysis II were that:

1) "There is a beneficial effect on the general quality of the educational environment resulting from decreasing class size."
2) The relationship between class size and non-achievement effects are more pronounced than the relationship between class size and achievement.
3) "The affective effects of class-size on pupils are positive but not as dramatic as the effects on teachers." "The effect of varying class size on instructional processes and environments is the same as the effect on pupil affect."
4) The effect of class size was greatest for pupils 12 years or younger, less for pupils from age 13-17, and least for pupils 18 and older.
5) Class size effects were more pronounced with comparisons from uncontrolled studies than from randomized or "well controlled" studies. The final conclusions in Meta-Analysis II were based on comparisons from all the studies, not just from the "well controlled" studies.
6) The effect of class size was greater in studies published from 1925 to 1968 than from 1969 to 1978.

CRITICISMS OF THE GLASS AND SMITH META-ANALYSES:

- Meta-Analysis I is based on only 14 studies selected by authors as "well-controlled"
- 73% of the comparisons came from four studies.
- Eight of 14 studies came from atypical instructional conditions (i.e. college classes or tutoring)
- The graph is not based on total number of 76 studies and 725 comparisons collected by Glass and Smith
- It statistically combines effects of class size on achievement across all

subjects, grade levels (college included), all ability levels

- Although "Achievement in Percentile Ranks" appears to be similar to percentile ranks for specific standardized tests, they are not related to the range of scores on any standardized test of academic achievement in existence
- Indicates that in a very wide mid-range of 20-40 pupils, size makes little difference in pupil achievement
- Or, viewed in another way, class size could be doubled from 20 to 40 pupils without significant effect on student achievement
- A substantial proportion of the comparisons used dealt with extremely small instructional arrangements such as one-to-one tutorials and classes of 2 to 5
- Meta-analysis procedure obscures and obliterates many helpful clues that are present in the research, such as those pertaining to pupils of varying abilities, subjects taught, or various grade levels
- "In attempting to integrate class size research into a single curve showing that smaller classes in themselves improve pupil achievement, the meta-analysis report places undue importance on the role of general class size reduction in the educational process." (Robinson and Wittebols, ERS)
- Fails to provide practical guidelines for making class size decisions
- When studies with only one student per teacher were removed from the data set, the effect of small classes on student achievement dropped nearly 50% (Leitner and Tracz, 1984)
- When classes of 2-5 students were eliminated, the effect of classes larger than 5 pupils dropped to one-third of what it was for the full data set
- A flatter curve than that published by Glass and Smith is found when statistics are recalculated based on "more accurate indicators" (according to Hedges and Stock, 1983) Class size effects only start to affect achievement at about 15 students

CONE META-ANALYSIS -- Thirty-eight percent of tests of class size found prior to 1950 found no significant differences whereas 18 percent of post-1950 class size studies favored small classes. While the meta-analysis indicated higher achievement in smaller classes, it did not indicate *significantly* higher achievement.

ERS SUMMARY OF CLASS SIZE RESEARCH -- ERS termed the relationship between class size and pupil achievement "highly complex" Among the conclusions of the summary are the following:

- Research provides no support for the concept of an optimum class size isolated from other factors. Rather, efficient class sizes are the product of many variables.
- Existing findings do not support the contention that smaller classes will of themselves result in greater academic achievement of pupils.

* Within the mid-range of 25 to 34 pupils, class size seems to have little if any impact on the academic achievement of most pupils in most subjects above the primary grades.
* There is evidence that small classes are important to increased pupil achievement in reading and mathematics in the early primary grades.
* There is also evidence of a positive relationship between small class size and pupil achievement when primary grade pupils are taught in small classes for two or more consecutive years.
* There is evidence that pupils with lower academic ability tend to benefit more from smaller classes than do pupils with average ability.
* Some research indicates that smaller classes can positively affect the scholastic achievement of economically or socially disadvantaged pupils.
* Few if any pupil benefits can be expected from reducing class size if teachers continue to use the same instructional methods and procedures in the smaller classes that they used in larger classes.
* Some studies have found that even when teachers have small classes many do not take advantage of them to individualize instruction.
* Research on class size suggests the importance of an emphasis on methods and quality of instruction rather than on the quantity of pupils in the classroom.

1986 ERS RESEARCH BRIEF -- Although the literature to this point revealed many interesting assertions, few specifics for decision making were given. In 1986 the Educational Research Service published another report, *Class Size Research - A Related Cluster Analysis for Decision Making*. (Robinson and Wittebols). This research brief summarized 100 class size studies from 1950 to 1985 including 80 of the studies used in the three summaries previously mentioned, with 20 additional studies completed after 1978.

As they considered which studies to include in the second summary by ERS, Robinson and Wittebols attempted to match, as closely as possible, the "typical" public school situation. This meant excluding some of the studies used previously in the meta-analyses of Cone, and Glass and Smith. The 1986 data base of the ERS analysis included studies conducted from 1950 to 1985 which involved kindergarten through twelfth grade classes which had a lower limit for class size at five students.

This analysis used a clustering approach to group and regroup the studies into 18 major areas of concern. These areas included:

* Four basic clusters by grade level -- K-3, 4-8, 9-12, and general studies
* Eight additional clusters by subject area -- reading, mathematics, language

arts, science, other subject areas, students grouped by academic ability, disadvantaged or ethnic students, and classes with 22 students or less

- * Two clusters relate specifically to teaching -- teaching practices, class size, instuctional methods, and learning interventions
- * Three clusters summarize affective and public opinion data -- student attitudes and behavior, teacher opinion regarding class size, and public opinion regarding class size
- * The final cluster is composed of examples of the magnitude of costs associated with specific class size policies -- cost effects of class size changes

The reason behind this related cluster analysis was that past generalizations had been of little help to school officials with limited financial resources. The crucial question among decision makers has become, "Where and how can additional resources best be used to improve the education of pupils?" The ERS Related Cluster Analysis is designed to identify and summarize all applicable research available on the effects of class size then group the research into clusters which relate to several major areas in which problems, issues and decisions are likely to occur.

Major Conclusions Drawn From 1986 ERS Research Brief Include:

- * The grades that show the most promising effects of small classes on pupil learning are the early primary grades (50% of the studies showed increased achievement).
- * Research shows a more modest relationship at the intermediate level (4-8) with 38% showing higher achievement in smaller classes.
- * Only 18.2% of the senior grade classes showed a relationship between class size and achievement.
- * In reading, 50% of the K-3 and 33% of the 4-8 classes found achievement greater in smaller classes than in larger.
- * In math, 35% of the K-3, 40% of the 4-8, and 0% of the 9-12 classes found achievement greater in smaller classes than in larger.
- * In language arts, 25% of the K-3, 14.3% of the 4-8, and 28.6% of the 9-12 classes found achievement greater in smaller classes than in larger.
- * In science, 14.3% of the 9-12 classes found achievement greater in smaller classes than in larger.
- * For academic ability and achievement in K-8, equally conflicting findings were reported.
- * There is evidence that lower-achieving students in life and physical science do better in larger classes with a highly qualified teacher.
- * The limited research tends to indicate that students of lesser academic ability achieve more in smaller classes. The evidence is mixed concerning

students of average or higher academic abilities.

- 66.7% of the comparisons dealing with disadvantaged or ethnic students found that academic achievement of pupils was higher in smaller classes.
- By grade clusters, this comparison dealing with disadvantaged or ethnic students breaks down to 55% for K-3 and 80% for 4-8.
- Where "small" meant 22 students or less, 71.4% of the studies found that pupils in the early primary grades, 50% for the intermediate grade studies, and 0% for the senior grade studies showed that students tended to learn more in smaller classes than in larger.
- 60% of the studies had the majority of their teachers favoring smaller classes. Teachers in smaller classes were found to use more desirable classroom practices.
- 40% found that teachers did not teach any differently in smaller classes than they had in larger classes.
- Fox study (1967) found that 55% of the teachers who were provided smaller classes did not effectively take advantage of their smaller class to individualize instruction.
- Taylor and Fleming study (1972) found that when class sizes were reduced and additional training and resources provided, teachers gave more individual attention to students and made better use of resources, but pupil achievement in reading and math were mixed between increases and decreases.
- Wright study (1977) found that there was no significant differences in the teaching practices of the same teachers with their earlier large class and their later small class. The teachers believed, however, that they had made favorable changes in teaching practices when their classes were reduced.
- Whittington study (1985) found that log entries of first grade teachers revealed areas of favorable change such as more pupil participation, more feedback to pupils, and faster pace of learning when their classes were reduced.
- In general, the last six findings indicate that smaller classes tend to promote the use of desirable teaching practices; however, smaller classes do not guarantee that teachers will adapt their teaching practices to take advantage of the smaller classes.
- In the area of instructional methods and learning interventions, Benjamin Bloom (1984) found that 90% of the students in one-to-one tutoring and 70% of the students in mastery learning classes of thirty pupils attained the level of summative achievement reached by only the highest 20% of the students taught under conventional instruction in a class of 30 pupils. He also found variations of time of task under these three conditions with 65% on-task under conventional instruction, 75% under master learning instruction, and more than 90% under one-to-one tutoring.
- Walberg (1984) searched for various factors related to educational

productivity. The instructional methods with the largest effects on learning were found to be reinforcement, acceleration, reading training, and clues and feedback, reinforcement, and clues and feedback (components of mastery learning) ranked first and fourth in their effects on educational outcomes. Those conditions with small effects on student learning were found to be class size and homogeneous groups. Programmed instruction and mainstreaming had negative effects. Walberg stated, "Reduced class size. . . has small positive effects but is expensive and draws money and effort away from factors with large effects." Cooperative learning, personalized instruction and adaptive instruction were found to be five to six times more effective in promoting learning than was the size of the class.

* Levin, Glass and Meister (1984) analyzed the relative cost-effectiveness of four instructional interventions in improving student learning in mathematics and reading in the primary grades: lowering class size, computer-assisted instruction, increased instructional time, and tutoring (peer, adult, and combination). Peer tutoring was over four times as effective in improving pupil achievement in math as a reduction in class size from 35 to 20 pupils. CAI in math is about one-half that shown for reducing class size from 30 to 20 pupils; in reading, the effect size for CAI is about twice that of reducing class size. Very small effect sizes were found for increasing the instructional time for both mathematics and reading.

* In the cluster of pupil behavior and attitudes, 66.7% of the K-3 student favored small classes, while 33.3% of the intermediate students and 25 % of the high school students had more positive attitudes in smaller classes.

* Large classes were identified as a serious problem by teachers, although generally falling below concerns about salary level. Two of the studies dealing with teacher opinions found teachers willing to accept a lower salary if it meant having smaller classes.

* In 70% of the national studies, teachers identify smaller class size as a contributor to high teacher morale, feelings of effectiveness, and more positive teacher attitudes.

* Public opinion regarding class size from the 1972-1977 Gallup Polls of Public Attitudes Toward Education ranked "size of school/classes" from fourth to seventh as a problem priority from a survey containing from twelve to twenty three items. The percentage of respondents considering class size a significant problem ranged from 5% to 10%.

Research Methodologies

When examining the literature, remember that methodologies vary in form and emphasis, making the drawing of conclusions difficult. Certain factors contribute to better research design:

* Correlational vs. experimental studies -- these are basically the two types of design used in class size research. Correlational studies usually possess less precise definitions of class size. It also tends to be secondary analysis of data. Experimental or quasi-experimental studies tend to control for more environmental factors and can therefore better assess the independent effects of class size change on student achievement.

* Definition of class size -- many measures are aggregates -- averages of all classes in a single subject, school or district which are then compared to aggregate measures of school- or district-wide achievement. Staff-student or teacher-student ratios are also less that adequate ways of measuring class size. Most accurate way to assess class size is to count the teachers and students in specific classrooms.

* Definition of "small" and "large" classes -- In some studies 35 constitutes a small class; in other studies, 30 is considered large. In more recent studies, as research has progressed, the problem has decreased. Most small classes are in the high teens or low twenties with large classes in the 30+ range.

* How achievement is measured -- achievement test scores may not be the best way to measure class size effects. (Burnstall, Erickson, and Lindbloom) Some research show greater satisfaction for teachers and more qualitative interaction and learning for students.

* Degree to which variables relate directly or indirectly to class size and classroom processes -- there is a tendency in class size research to treat class size as an isolated variable. The NEA Research Division (1968) notes that "Although the study of classroom environment is a multivariate problem, most class size research conducted to date has tended to use a single variable approach." Many variables affect class size research. These include:

I. The Pupils
    A. Age
    B. Sex
    C. Grade Level

    - D. Grouping Arrangement
    - E. Ability Level
    - F. Socioeconomic Status
- II. The Teacher
    - A. Ability
    - B. Experience
    - C. Education
    - D. Role Perception and Teaching Philosophy
    - E. Availability of Other Instruction Personnel
        - 1. Teacher Aides
        - 2. Student Teachers
        - 3. Interns
- III. Subject Matter
    - A. Content
    - B. Complexity
    - C. Goals
- IV. Teaching Methods
    - A. Team Teaching
    - B. Individualized Instruction
    - C. Large Group Instruction
    - D. Use of Educational Media
    - E. Differentiated Staffing
    - F. Innovative Instructional Techniques

Class Size in the State of Utah

Few would argue the point that the size of many classes in the Utah's public school system are atypically large; nor would they argue that high classroom enrollments place an additional workload on teachers. Educators, however, must be cautioned against making costly decisions such as uniform class size reductions before examining and understanding some of the uniquenesses of Utah's demographics.

In just about every report on the subject, demographically, Utah is very different from most other state. We know that we're different in many, many ways, but among the most important differences within this context, are first, that we have more school-aged children per household than any other state, and second, that our per capita income ranks among the lowest 20% in the nation.

According to the Governor's report on Education in December 1989, Utah's pupil-teacher ratio is 24.9 -- this is the averaged size with classroom teachers only. Utah is ranked fifty-first in the nation with the highest pupil-teacher ratio. Interestingly, our average class size has not changed significantly over the past fifteen years. Our class size in 1973 was exactly the same as it is today. (see Appendix C) In fact, it is lower by 17% than the ratio that existed in 1963-64.

Even though our class size has stayed relatively constant, year by year Utah has moved higher and higher in the national class size rankings largely because of class size reductions in other states. Our demographics make it very difficult for us to keep pace with the rest of the country. In order for the state of Utah to bring our average class size down to the national average of 17.5 students per class it would cost us approximately $131 million just for teacher salaries and benefits. This figure does not include the capital outlay for additional classroom space or salaries for additional building administrators and support staff.

Just for fun, I got out my calculator and did some figuring. If we reduced class size to the national average we would need 7,295 additional classrooms. If schools averaged, say, 50 classrooms, we would need to build about one hundred forty-five schools. Even if schools cost only two million dollars to build (which is a low figure for property and a new building along the Wasatch Front,) the capital expenditure would be an *additional* sum which in and of itself, would be more than twice the cost of the initial $131 million. Add salaries and benefits for building administrators and support staff, and we're talking about an awful lot of money.

It seems unrealistic in the state of Utah to cite student achievement in very small classes (15-20) as a rationale for reducing class size from 24.9 to 23.9, or more typically from 32 to 31 or 42 to 41. The result of a one student per class reduction in Vermont (average size 13.08) to 12.08 would be very different than the same reduction of one student per class in our state. Even if we were to reduce class size by five students from 32 to 27, 42 to 37, or even 24.9 to 19.9, research says that as far as *achievement* goes, it will make very little significant difference.

We need to use good judgement and ask the right questions. What is our goal? What does the research show? Does class size really matter? Do smaller classes really lead to higher student achievement, as many proponents claim? How successful have other states been? How much will it cost? Is it worth the cost? With limited funds for education, the reduction of class size in Utah will be a high-priced reform. Are the achievement gains significant enough to be worth the increased costs?

We also need to ask: If we made uniform reductions in class size, what would happen productivity models such as year-round or extended-day schools? Where would the additional students be housed? How much additional work will need to be handled by existing district and state support services? . . . I'm sure that you can add to the list of significant questions.

Recommendations for Policy Makers

The Education Commission of the States, in a November 1989 article in Education Week, makes the following recommendations for policy makers considering class-size reductions:

- * Define the goal. For example, improve achievement for which students? In which subjects? At what level? Improve teacher morale, improve student self-concept, improve school climate, improve student attendance, etc.?
- * Examine the research that relates to the goal.
- * Monitor current class-size initiatives as they relate to this goal.
- * Remember there is no one optimum class size. It is the function of many factors, including grade level, subject area, instructional methods, skills of teachers and aides, nature of pupils andavailability of materials and facilities.
- * Provide funding for teacher inservice training. Teachers must be trained and supported in instructional methods to take advantage of smaller classes. Few, if any, pupil benefits can be expected if teachers continue to use the same instructional methods and procedures in smaller classes that they used in larger classes.
- * Analyze the cost.

Sue Geary, in her paper entitled, "Class Size: Issues and Implications for Policymaking in Utah" (University of Utah, 1988) notes the following policy implications:

- * Class size is an important issue for Utah lawmakers to consider given that the state's pupil-teacher ratio is the highest in the nation and the enrollment is expected to increase.
- * Utah's average class size would have to be significantly decreased for achievement to be enhanced for the majority of students. Within the range of 20-40 students, a decrease in class size has a trivial impact on achievement for most students; therefore, the goal to reduce class size in the elementary grades to 24 students should not be expected to produce achievement gains. Achievement benefits begin to be noticeable when class size is trimmed to below 20 students. Significant student advancement requires class size reduction to 15 students.
- * If only modest adjustments in the pupil-teacher ratio are possible for Utah, those adjustments should be directed to low-achieving students, whose

academic performance can be expected to improve as a result of modest class size reductions.

- The satisfaction of Utah's public school students and the morale of the state's teachers might be expected to improve with modest class size reductions.
- Instruction will not improve as a result of class size reductions unless teachers are retrained for the more individualized instruction made possible with smaller classes.
- Efforts should be made to reduce the average size of Utah's public school classes. The variety of options for reducing instructional group size should be carefully considered.

Alternative Strategies for Class Size Reductions

Criticism of the Glass and Smith meta-analyses came from many points of view soon after the report was made public. Over the last ten years, opponents and proponents of class size reduction have contributed numerous columns to the literature of education. Let's assume for the sake of making a point, that the Glass and Smith findings are valid -- that class sizes of 15 to 20 could yield significant achievement gains. We then go back to our previous argument that uniform class size reductions from Utah's official 24.9 to 15 pupils per teacher, are prohibitively costly and conditionally effective.

Some class size researchers have turned their efforts toward identifying specific factors that are unique to small classes. Their question is, "What is it that happens in classes of 15 that *doesn't* happen in a class of 25 or 30?" Other researchers are studying ways of optimizing the use of groups within average-sized classes.

Studies of smaller classes have revealed that class size does not influence the amount of time that teachers spend in individualized instruction. According to the Far West Laboratory field studies conducted during 1978 and 1979, in smaller classes each child received more individual attention from the teacher; the students paid more attention to their work; the curriculum took on greater depth, breath and richness; and discipline problems diminished. General instructional approaches, textbooks, and methods of discipline remained the same. Nicola Filby of Far West Laboratory notes:

> There are predictable differences in class processes that follow simply from the numbers: lines are shorter; students are more visible, each student is more likely to get a turn more often during lessons; students don't have to wait as long for help. These changes, in turn, mean higher student attention, fewer discipline problems, and improved attitudes among teachers and students toward their experiences in the classroom. . . . But class size reductions alone will not bring major changes in the way instruction is organized and delivered. Teachers may feel more confident about classroom management and [thus be] more likely to use activities that involve student participation and movement (e.g., games, science experiments). They may provide more enrichment. They are not likely to try dramatically different methods of instruction, unless class size reductions are combined with specific introduction and support of such programs.

Few small-group instruction techniques are widely used in U.S. classrooms. Teachers have the tendency to lecture to their students. Filby argues that teachers need to use models within the parameters of a traditional classroom which allow for flexible, small-group instruction.

In 1981, Far West Laboratoaries surveyed schools in the western United States to find out what types of groupings were used in their schools. The product of that research was *Grouping for Instruction: A Catalog of Arrangements*. In this publication, researchers Steven Bossert and Bruce Barnett discussed many grouping strategies which were being used at that time. They included cross-age tutoring, learning centers, pull-out programs, staggered or split scheduling, subject-matter groupings and team teaching. Bossert and Barnett also addressed potential problems such as using classroom aides effectively, finding time to spend with other teachers, and informing and involving parents in the program.

Of course, there are also the options of uniform class size reduction, use of computer assisted instruction or other technological resources, differentiated staffing, and grouping arrangements such as cooperative learning. While some of these schemes are recent innovations, most of them are not. They vary in cost and their level of effectiveness. Many buildings adopt a combination of these options as they fit the needs, philosophy, and resources of the school.

The class size debate made headlines again in 1988 when the somewhat controversial publication, *Class Size and Public Policy: Politics and Panaceas* was published by the U.S. Office of Education. In this booklet, researcher Tommy Tomlinson stated that rather than taking the easily comprehended but simplistic route of reducing class size to improve student achievement, teachers and policy makers could instead consider more complicated but probably more practical dimensions of school improvement.

He went on to point out that some researchers are now in the process of trying to distinguish between problems of too many students and too little teaching. "That teachers can be taught to manage complicated classroom situations is beyond question," writes Tomlinson. "Whether they should be expected to learn these skills or whether the size of their classes should be reduced to obviate their need for them, is at the heart of the present debate."

Albert Shanker, president of the American Federation of Teachers, has chosen to face the issue squarely. Noting that widespread concern about teacher competence has placed intence pressure on schools of education to raise their admission and performance criteria, and citing the creation of a National Board for Professional Teaching Standards as central to a new effort to devise professional standards, Shanker thinks it is critically important that teachers seek to improve their performance by strengthening their skills rather than by teaching fewer children. Doing better by doing less will not convince the public or its policymakers of teachers' competence and professionalism.

To clarify and summarize what has been written on strategies for class size reduction we can say this:

1) Many educators advocate for uniform class size reduction. Research suggests that legislated reductions of this type may or may not lead to gains in student achievement. The success level of uniform reductions would be dependent on many other significant variables. This educational reform is prohibitive because of its cost -- especially in a state such as Utah.

2) Selective class size reduction is another option. Monies could be directed to areas of greatest need or where research shows the most effect. These might include: classes in reading and math in the primary grades, classes with a high population of low-achieving students, or classes where enrollments are exceptionally high.

3) The third option is where educators use their problem solving skills to modify instructional arrangements. This is typically accomplished by using three general strategies: modification of the distribution of teachers, modification of instructional methods or modifications of the distribution of students.

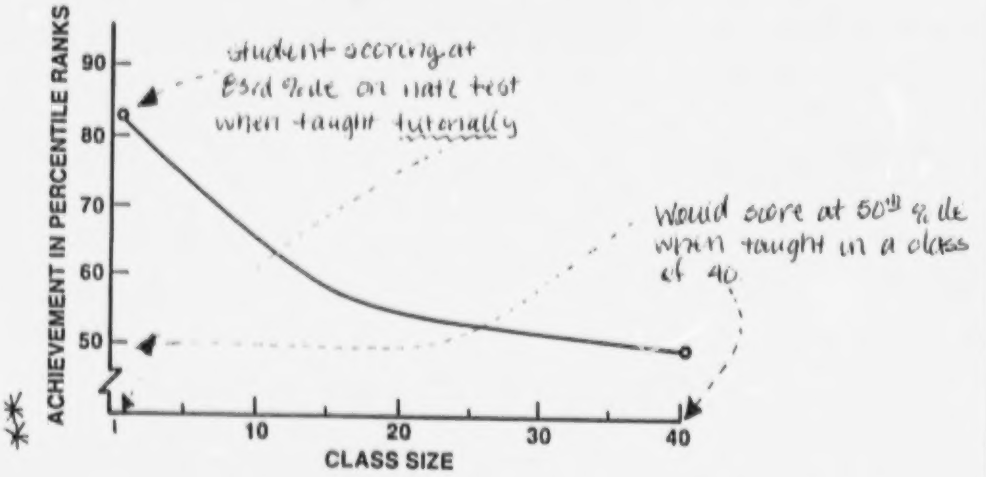
APPENDICES

A	**Figure 2 -- Relationship Between Achievement and Class Size.** (Gene V. Glass and Mary Lee Smith. *Meta-Analysis of Research on the Relationship of Class-Size and Achievement.*)
B1 - B37	**Cluster Summaries, 1 - 18.** (Glen E. Robinson and James H. Wittebols. *CLASS SIZE RESEARCH A Related Cluster Analysis for Decision Making.*)
C	**Demographics.** (A Utah Public Education Report by the Governor's Task Force on Educational Data. *How Do We Stack Up?*)
D	**State Pupil-Teacher Ratios, 1987-88.** (Utah State Office of Education. *Summary of Statistical and Financial Data.*)
E1 - E5	**State Pupil-Teacher Ratios, 1985-1987.** (Utah Education Association. *UEA Research Bulletin: Class Size Survey 1986-87.*)
F1 - F6	**Bibliography of Class Size Studies Since 1950.** (Glen E. Robinson and James H.Wittebols. *CLASS SIZE RESEARCH A Related Cluster Analysis for Decision Making.*)
G1 - G5	**Bibliography of Additional References.** (Glen E. Robinson and James H.Wittebols. *CLASS SIZE RESEARCH A Related Cluster Analysis for Decision Making.*)

H1 - H2	**Bibliography of Class Size Studies Done Before 1950.** (Glen E. Robinson and James H.Wittebols. *CLASS SIZE RESEARCH A Related Cluster Analysis for Decision Making.*)
I	**Bibliography of Class Size Studies Concerned with Tutoring or Special Education.** (Glen E. Robinson and James H.Wittebols. *CLASS SIZE RESEARCH A Related Cluster Analysis for Decision Making.*)
J	**Bibliography of Residual and Unobtainable Class Size Studies.** (Glen E. Robinson and James H.Wittebols. *CLASS SIZE RESEARCH A Related Cluster Analysis for Decision Making.*)
K	**Bibliography of Glass and Smith's "Well Controlled" Studies.** (Glen E. Robinson and James H.Wittebols. *CLASS SIZE RESEARCH A Related Cluster Analysis for Decision Making.*)

APPENDIX A

Figure 2.--Relationship Between Achievement and Class Size. (Data Integrated Across Approximately 100 Comparisons from Studies Exercising Good Experimental Control.)



SOURCE: Gene V Glass and Mary Lee Smith. *Meta-Analysis of Research on the Relationship of Class-Size and Achievement.* [133]

(9/78)

* The implication here is that percentile ranks are related to those on nationally standardized
* achievement test scores

SUMMARY
CLUSTER 1 -- THE EFFECTS OF CLASS SIZE ON ACHIEVEMENT IN GRADES K-3

This research cluster presents studies conducted from 1950 through 1985 that relate to the effects of class size on pupil achievement in the early primary grades of K-3. There are 22 studies described. An analysis of this cluster of 22 studies yields the following specific observations:

- Studies to date indicate that smaller classes tend to have a positive effect on pupil learning in the early primary grades (K-3).
- The number of studies showing increased achievement in smaller classes exceeds those showing increased achievement in larger classes by a ratio of 5.5 to 1.
- 11 of the 22 studies found that *smaller* classes influence pupil achievement in a positive direction; 2 studies found pupil achievement to be higher in larger classes; and 9 studies found no effects of class size on pupil achievement.
- 50 percent of all class size studies in this group found pupil achievement to be higher in smaller than larger classes.
- 40.9 percent of the studies found no significant differences in pupil achievement between smaller and larger classes; 9.1 percent found differences in favor of larger classes.
- All of the 22 studies involved the effects of class size on reading achievement.
- 14 of the 22 studies involved arithmetic or mathematics.
- 4 of the 22 studies involved language arts, and 1 involved study skills.
- 8 of the 22 studies involved classes as small as 15 pupils; 13 involved classes smaller than 22 pupils.
- 6 of the 22 studies involved classes of 30 or more pupils.
- The definition of "small" classes in the studies ranged from a low of 13 pupils to a high of 29 pupils.

(*continued*)

SUMMARY
CLUSTER 1 -- THE EFFECTS OF CLASS SIZE ON ACHIEVEMENT IN GRADES K-3 (CONTINUED)

- The definition of "large" classes in the studies ranged from a low of 22 pupils to a high of 40 or more pupils.
- In general, the more recent studies that have used a "small" class range of 15-22 have found such class sizes to be related to greater student learning in the early primary grades (K-3).

To assist the user of these data to become familiar with the nature and limitations of these studies, a *Synoptic Table* of the 22 studies comprising this research cluster follows. The synopsis of each study shows in abbreviated form the subject area studied, the grade level, the sample sizes, the class sizes involved, the study findings, and any additional factors or comments from the literature.

Included in parenthesis in the "comments" column is the way that the present authors classify the general effect of the study's findings as favoring improved pupil achievement in either large or small classes, based on the conclusions of the researchers who actually conducted the study. An "S" indicates that, in the opinion of its own author, the study found that *smaller* classes as compared with larger classes (in the range studied) showed greater pupil achievement. An "L" indicates that, in general, the study findings favored greater pupil achievement in *larger* classes. An "N" indicates the study findings showed *neither* large or small classes (in the range studied) to be superior in pupil achievement.

SUMMARY
CLUSTER 2 -- THE EFFECTS OF CLASS SIZE ON ACHIEVEMENT IN GRADES 4-8

This research cluster presents studies conducted from 1950 through 1985 that relate to the effects of class size on pupil achievement in the junior grades of 4-8. There are 21 studies described. Seven of the studies also contain findings pertaining to pupil achievement in grades K-3; those findings were discussed previously in Cluster 1. An analysis of this cluster of research yields the following specific observations:

- Studies to date indicate that smaller classes tend to have a slight positive effect on student achievement in the junior grades of 4-8, but the evidence is not nearly as strong as in the early primary grades of K-3.
- The number of studies favoring increased achievement in smaller classes exceeds the number favoring achievement in large classes by a ratio of 2.7 to 1.
- 38.1 percent of all class size studies in this group found student achievement to be higher in smaller classes than in larger classes.
- 47.6 percent of all the class size studies concerned with grades 4-8 found no significant differences between pupil achievement in smaller and larger classes; 14.3 percent found differences in favor of larger classes.
- 14 of the 21 studies involved the effects of class size on reading achievement.
- 15 of the 21 studies involved the effects of class size on achievement in arithmetic or mathematics.
- 7 of the 21 studies involved language arts or English, 1 social studies, 1 spelling, 1 art, 1 creative drawing, and 1 cognitive and non-cognitive output measures.
- 6 of the 21 studies involved classes as small as 15 pupils; 10 involved classes of 22 or fewer pupils.
- 14 of the 21 studies involved classes of 30 or more pupils.

(continued)

SUMMARY
CLUSTER 2 -- THE EFFECTS OF CLASS SIZE ON ACHIEVEMENT IN GRADES 4-8 (CONTINUED)

- The definition of "small" classes in the studies ranged from a low of 5 pupils to a high of 36 pupils.
- The definition of "large" classes in the studies range from a low of 22 pupils to a high of 55 pupils.

To assist the user of these data to become familiar with the nature and limitations of these studies, a *Synoptic Table* of the 21 studies comprising this research cluster follows. The synopsis of each study shows in abbreviated form the subject area studied, the grade level, the sample sizes, the class sizes involved, the study findings, and any additional factors or comments from the literature.

Included in parenthesis in the "comments" column is the way that the present authors classify the general effect of the study's findings as favoring improved pupil achievement in either large or small classes, based on the conclusions of the researchers who actually conducted the study. An "S" indicates that, in the opinion of its own author, the study found that *smaller* classes as compared with larger classes (in the range studied) showed greater pupil achievement. An "L" indicates that, in general, the study findings favored greater pupil achievement in *larger* classes. An "N" indicates the study findings showed *neither* large or small classes to be superior in pupil achievement.

SUMMARY
CLUSTER 3 -- THE EFFECTS OF CLASS SIZE ON ACHIEVEMENT IN GRADES 9-12

According to the research base presently available for analysis, the effects of class size on student achievement in the senior grades (9-12) are quite different from the effects of class size on achievement in the early primary grades (K-3).

This research cluster presents studies conducted from 1950 through 1985 that relate to the effects of class size on student achievement in the senior grades of 9-12. A total of 22 studies compose this cluster of research. Three of these studies also contain findings pertaining to achievement in grades K-3 and/or grades 4-8; these findings were discussed previously in Clusters 1 and 2. An analysis of this cluster yields the following specific observations:

- Research to date fails to indicate that in the senior grades of 9-12 smaller classes have positive effects on student achievement in the ranges and under the conditions studied. It should be emphasized, however, that the research base of studies concerned with student achievement in the senior grades (9-12) is limited in the number of studies pertaining to any one subject, and a number of these require careful scrutiny.
- The number of studies showing increased achievement in smaller classes (4) exceeds the number showing increased achievement in larger classes (3) by a ratio of 1.3 to 1.
- Only 18.2 percent (fewer than 1 in 5) of the 22 studies involving class size and student achievement in the senior grades (9-12) indicated that student achievement was greater in smaller classes than in larger classes, in the ranges studied.
- 81.8 percent of the 22 studies dealing with student achievement in grades 9-12 either favored larger classes (3) or showed no significant differences between achievement in smaller and larger classes (15), in the ranges studied.
- 7 of the 22 studies involved student achievement in mathematics, 7 in natural sciences, 7 in English or creative writing, 4 in social sciences, and 2 in business subjects.

(continued)

SUMMARY
CLUSTER 3 -- EFFECTS OF CLASS SIZE ON ACHIEVEMENT IN GRADES 9-12 (CONTINUED)

- Definitions of "small" classes ranged from a low of 5 students to a high of 40 students.
- Definitions of "large" classes ranged from a low of 26 students to a high of 192 (team taught) students.
- It is important to observe that 10 of the 22 studies dealt with extremely large classes with 45 or more pupils. Further, all of these studies were conducted between 1961 and 1970, a period of great overcrowding in both public and private schools, when concern was focused on how large classes could be without harming pupil achievement rather than how small they should be to improve student achievement.
- Only 5 studies involved classes smaller than 22 students.

To assist the user of these data to become familiar with the nature and limitations of these studies, a *Synoptic Table* of the 22 studies composing this research cluster follows. The synopsis of each study shows in abbreviated form the subject area studied, the grade level, the sample sizes, the class sizes involved, the study findings, and any additional factors or comments from the literature.

Included in parenthesis in the "comments" column is the way that the present authors classify the general effect of the study's findings as favoring improved student achievement in either large or small classes, based on the conclusions of the researchers who actually conducted the study. An "S" indicates that, in the opinion of its own author, the study found that *smaller* classes as compared with larger classes (in the range studied) showed greater pupil achievement. An "L" indicates that, in general, the study findings favored greater pupil achievement in *larger* classes. An "N" indicates the study findings showed *neither* large or small classes to be superior in pupil achievement.

SUMMARY

CLUSTER 4 -- GENERAL STUDIES RELATING TO THE EFFECTS OF CLASS SIZE ON STUDENT ACHIEVEMENT

This section has grouped together and described eight studies, each of which examined the effects of class size or pupil-teacher ratio on student achievement as part of a broad study concerning many variables.

The authors in 6 of the 8 studies (75 percent) interpreted their findings as indicating that smaller classes and low pupil-teacher ratios are associated with increased student achievement; the authors in 2 studies (25 percent) found no significant relationship between class size and pupil achievement.

To assist the user of these data to become familiar with the nature and limitations of these studies, a *Synoptic Table* of the 8 studies comprising this research cluster follows. The synopsis of each study shows in abbreviated form the subject area studied, the grade level, the sample sizes, the class sizes involved, the study findings, and any additional factors or comments from the literature.

Included in parenthesis in the "comments" column is the way that the present authors classify the general effect of the study's findings as favoring improved pupil achievement in either large or small classes, based on the conclusions of the researchers who actually conducted the study. An "S" indicates that, in the opinion of its own author, the study found that *smaller* classes as compared with larger classes (in the range studied) showed greater pupil achievement. An "L" indicates that, in general, the study findings favored greater pupil achievement in *larger* classes. An "N" indicates the study findings showed *neither* large or small classes to be superior in pupil achievement.

CHAPTER 3 SUMMARY

CLASS SIZE AND STUDENT ACHIEVEMENT: STUDIES CLUSTERED BY GRADE LEVEL

The 35 years of research reviewed in this chapter, although voluminous, offers little in the way of all-encompassing conclusions. Quite the contrary, the studies reviewed here show clearly that broad and sweeping conclusions about the effects of class size on pupil achievement across grade levels, subject areas, and pupil categories are not justified and can be misleading. Thus, to find helpful and practical meaning from this large body of studies, it has been necessary first to sort the studies into clusters related to three grade levels -- the early primary grades K-3, the junior grades 4-8, and the senior grades 9-12 -- which are basic areas of concern to class size decision makers.

The purpose of this chapter is to help the reader to become familiar with and to understand the existing research on the effects of class size related to student achievement at each of the three grade levels: K-12, 4-8, and 9-12. By first looking at specific clusters of studies grouped by grade level, the reader can reach more reliable conclusions about the possible effects of smaller classes. An understanding of how this body of research differs when examined by grade level is fundamental to its later analysis by subject areas and other factors.

Of the three grade ranges used for analysis, the research indicates clearly that the grades that show the most promising effects of small classes on pupil learning are the early primary grades (K-3). At this grade level, 50 percent of the studies found that pupil achievement was higher in smaller classes; 9.1 percent found that achievement was higher in larger classes; and 40.9 percent found no significant difference between smaller and larger classes. Research that used a small class range of 15-22 also found more often than not that small classes were related to improved pupil achievement.

When the cluster analysis of research moves to the junior grades 4-8, a weaker and more modest relationship between class size and pupil

(continued)

CHAPTER 3 SUMMARY
(CONTINUED)

CLASS SIZE AND STUDENT ACHIEVEMENT: STUDIES CLUSTERED BY GRADE LEVEL

achievement is found. At this grade level, 38.1 percent of the studies found that pupil achievement was higher in smaller classes; 14.3 percent found that achievement was higher in larger classes; and 47.6 percent found no significant difference between smaller and larger classes.

When the studies are sorted into a cluster related to the effects of class size on student achievement in the senior grades of 9-12, the relationship between smaller classes and improved achievement becomes weak and uncertain. Only 18.2 percent of the studies show findings favoring increased achievement in smaller classes; 13.6 percent show increased achievement in larger classes, and the remaining 68.2 percent show no significant differences .

It must be emphasized that nearly half of the studies (10 of the 22) in the grade 9-12 cluster dealt with extremely large classes having 45 or more pupils in the larger classes. Moreover, all of these studies were conducted between 1961 and 1970, a period of great overcrowding in both public and private schools when much attention was being given to the effects of overcrowded classes on pupil achievement.

This chapter presents a final cluster of 8 general studies that examine the effects of class size on student acheivement as part of a broad study concerning many variables. In 6 of the 8 studies, the authors interpreted their findings as indicating that smaller clases and low pupil-teacher ratios are asociated with increased student achievement.

The table on the following page shows the substantial decline in the strength of relationship between class size and pupil achievement as the analysis moves across the three grade-level clusters contained in this Related Cluster Analysis.

(continued)

CHAPTER 3 SUMMARY (CONTINUED)

CLASS SIZE AND STUDENT ACHIEVEMENT: STUDIES CLUSTERED BY GRADE LEVEL

STUDY COUNT

GRADE LEVEL	TOTAL STUDIES	FAVOR SMALL	NEITHER	FAVOR LARGE	RATIO SMALL/LARGE	PERCENT FAVOR SMALL
K-3	22	11	9	2	5.5:1	50.0%
4-8	21	8	10	3	2.7:1	38.1%
9-12	22	4	15	3	1.3:1	18.2%
General Studies	8	6	2	0	6:0	75.0%

NOTE: Data from 65 grade-level comparisions contained in 55 separate studies of class size and pupil achievement, 1950 to 1985.

APPENDIX B11

SUMMARY
CLUSTER 5 -- CLASS SIZE AND ACHIEVEMENT IN READING

- 54.5 percent (30 of 55) of the studies dealing with the effects of class size on student achievement in grades K-12 concern reading achievement, at least in part.
- The 30 studies yielded 38 different grade-level comparisons of the relationship between class size and reading achievement.
- Almost 6 in 10 grade level-comparisons concerned with class size and reading achievement (22 of the 38) are in grades K-3.
- One-half of all studies with K-3 grade-level comparisons (11 of the 22) found reading achievement greater in smaller classes than larger classes. Another 9 studies favored neither small nor large classes; 2 studies favored large classes.
- The ratio of studies favoring achievement in smaller classes versus larger classes in grades K-3 is 5.5 to 1.
- 14 studies concern class size and reading achievement in grades 4-8; the ratio favoring smaller classes over larger classes is 2.5 to 1.
- Definitions of small classes range from a low of 13 pupils to a high of 35 pupils.
- Definitions of large classes range from a low of 22 pupils to a high of 40 plus pupils.
- 17 of the 30 reading studies (56.7 percent) involved class sizes of 22 students or less.

STUDY COUNT

GRADE LEVEL	TOTAL STUDIES	FAVOR SMALL	NEITHER	FAVOR LARGE	RATIO SMALL/LARGE	PERCENT FAVOR SMALL
K-3	22	11	9	2	5.5:1	50.0%
4-8	14	5	7	2	2.5:1	35.7
9-12	2	1	1	0	1:0	50.0

SUMMARY
CLUSTER 6 -- CLASS SIZE AND ACHIEVEMENT IN MATHEMATICS

- 52.7 percent (29 of 55) of the studies dealing with the effects of class size on student achievement in grades K-12 concern mathematics achievement, at least in part.
- The 29 studies yielded 36 different grade-level comparisons of the relationship between class size and mathematics achievement.
- 14 of the 36 grade-level comparisons concerned with class size and mathematics achievement are in grades K-3. Of these, 5 found pupil achievement higher in smaller classes. The ratio of studies favoring smaller classes versus larger classes at the K-3 level is 5 to 1.
- 51.7 percent of the grade-level comparisons were in grades 4-8; 40 percent of these found pupil achievement in mathematics higher in smaller classes. The ratio of studies favoring smaller classes versus larger classes in grades 4-8 is 3 to 1.
- At the grade 9-12 level, a total of 7 studies pertain to the effects of class size on student achievement in mathematics. None of these indicates greater achievement in smaller classes; 2 indicate greater achievement in larger classes.
- Definitions of small classes range from a low of 5 pupils to a high of 40 pupils.
- Definitions of larger classes range from a low of 22 pupils to a high of 192 pupils (with 2 teachers).
- 16 studies involved class sizes of 22 or fewer pupils.

STUDY COUNT

GRADE LEVEL	TOTAL STUDIES	FAVOR SMALL	NEITHER	FAVOR LARGE	RATIO SMALL/LARGE	PERCENT FAVOR SMALL
K-3	14	5	8	1	5:1	35.7%
4-8	15	6	7	2	3:1	40.0
9-12	7	0	5	2	0:2	0.0

SUMMARY
CLUSTER 7 -- CLASS SIZE AND ACHIEVEMENT IN LANGUAGE ARTS

- Over one-fourth (27.3 percent, or 15 of the 55 studies) of all research conducted from 1950 to 1985 concerning the relationship between class size and student achievement in grades K-12 included achievement in English or language arts.
- The 15 studies yielded 18 different grade level comparisons of the relationship between class size and achievement in English or language arts.
- Four of the 15 studies of achievement in language arts were in grades K-3. The definition of small classes ranged from 15 to 26 pupils, and large classes ranged from 22 to 30 or more pupils. One study reported superior achievement in smaller classes, and 3 found no significant difference in student achievement relating to class size.
- Seven of the 15 studies dealt with grades 4-8. Small classes ranged from 15 to 34 pupils, and larger classes ranged from 22 to 55 pupils. One of the 7 studies reported greater pupil achievement in smaller classes. 1 favored larger classes, and 5 found neither superior .
- Seven of the 15 studies reported findings in grades 9-12. Small classes ranged from 10 to 35 pupils, and large classes ranged from 26 to 100 or more pupils. Findings in 2 studies favored smaller classes; 2 favored larger classes, and 3 found neither superior.
- Of the 7 studies concerning student achievement in English in grades 9-12, 4 involved extremely large classes of 35 to 100 or more pupils; it should be noted that all of these studies were conducted in the late1950s and early 1960s, a period of severe overcrowding in many public and private schools.

STUDY COUNT

GRADE LEVEL	TOTAL STUDIES	FAVOR SMALL	NEITHER	FAVOR LARGE	RATIO SMALL/LARGE	PERCENT FAVOR SMALL
K-3	4	1	3	0	1:0	25.0%
4-8	7	1	5	1	1:1	14.3
9-12	7	2	3	2	1:1	28.5

SUMMARY
CLUSTER 8 -- CLASS SIZE AND ACHIEVEMENT IN SCIENCE

- Seven studies dealing with the relationship between class size and student achievement in science in grades K-12 were reported between 1950 and 1985.
- All seven of the studies concerned the relationship of class size to achievement in science in grades 9-12; 5 studies reported no significant impact of class size on achievement in science, 1 study favored small classes, and 1 favored large classes.
- Of the 7 studies concerning student achievement in science in grades 9-12, 5 involved extremely large classes of 35 to 100 or more students. It should be noted that these studies were conducted between 1958 and 1977, a period of severe overcrowding in many public and private schools.

STUDY COUNT

GRADE LEVEL	TOTAL STUDIES	FAVOR SMALL	NEITHER	FAVOR LARGE	RATIO SMALL/LARGE	PERCENT FAVOR SMALL
K-3	0	0	0	0	...	...
4-8	0	0	0	0	...	...
9-12	7	1	5	1	1:1	14.3%

SUMMARY
CLUSTER 9 -- CLASS SIZE AND ACHIEVEMENT IN OTHER SUBJECTS

- A total of 14 studies were reported between 1950 and 1985 in grades K-12 that concerned the effects of class size on pupil achievement in subjects other than the four areas of reading, mathematics, language arts, and science. Two of the studies dealt with more than one grade level, yielding a total of 16 grade-level comparisions.
- Only 1 study was reported in grades K-3. This study concerned the effects of class size on the study skills of early primary grade pupils. The study found no differences among pupils in smaller and larger classes.
- In grades 4-8, 7 studies dealt with other subject areas: 2 testing the relationship between class size and achievement in basic skills, and one each testing study skills, creative drawing, history and geography, art, and cognitive/noncognitive measures. Two studies found student achievement higher in smaller classes; 5 found no significant differences between achievement levels in larger or smaller classes.
- In grades 9-12, 8 studies dealt with other subject areas. Two studies concerned American history. One study concerned student achievement in each of the following areas: geometrical drawing; business law, introductory business, and government; typing; cognitive/noncognitive measures; general academic ability; and aptitude and achievement tests. Two of the studies reported findings that indicated greater achievement in smaller classes, and 6 reported no differences in smaller versus larger classes.

STUDY COUNT

GRADE LEVEL	TOTAL STUDIES	FAVOR SMALL	NEITHER	FAVOR LARGE	RATIO SMALL/LARGE	PERCENT FAVOR SMALL
K-3	1	0	1	0	0:0	0.0%
4-8	7	2	5	0	2:0	28.6
9-12	8	2	6	0	2:0	25.0

SUMMARY
CLUSTER 10 -- CLASS SIZE, ACADEMIC ABILITY, AND ACHIEVEMENT

- Of the 55 studies dealing specifically with relationships between class size and student achievement in grades K-12, only 9 involve an analysis of factors that indicate the *academic ability* of students engaged in the study. These nine fall into the grade-level categories K-3, 4-8, or 9-12; another 8 general studies indicate academic ability but fall into no specific grade-level category.
- In grades K-3, there were only 2 studies, both dealing with reading and mathematics achievement of first-grade pupils. One was a controlled experimental study, the other a two-stage correlational study. The experimental study found significant improvement in both reading and mathematics when lower-achieving first-grade pupils were taught in class sizes of 15 pupils compared with classes of 25 pupils. The correlational study reported mixed results for below-average, average, and above-average students in large and small classes for reading and mathematics; most groups did better in larger classes.
- In grades 4-8, only 2 studies dealt with student ability and achievement relating to class size, both were correlational studies. One dealt with extremely large classes of 40 or more pupils compared with classes of less than 36; academic gains for average and below-average IQ groups were found higher in larger classes, but no significant differences were found for above-average IQ pupils. The other study found pupils who scored low on tests of basic skills were negatively affected by class sizes in the range of 28 to 33 pupils compared with classes of less than 28; achievement of pupils scoring high on basic skills tests was found to be positively affected in classes of 28 to 33. All groups were negatively affected in classes of 34 or more.
- In grades 9-12, 6 studies have reported different and varied results, but there seems to be some indication that smaller classes can be beneficial to lower- achieving students, at least in the areas of English and writing skills.

(continued)

SUMMARY
CLUSTER 10 -- CLASS SIZE, ACADEMIC ABILITY, AND ACHIEVEMENT
(CONTINUED)

- A study of life and physical science classes at the 9-12 grade level indicated that lower-achieving students do better in larger classes with a *highly qualified teacher.*

- Of the 8 general studies in this cluster, 6 found that achievement tended to increase as class size or pupil/teacher ratios decreased for students of lower socioeconomic status, racial minorities, and draftees who had failed the selective service mental test.

- The limited research available tends to indicate that students of lesser academic ability achieve more in smaller classes; the evidence is mixed concerning students of average or higher academic ability.

STUDY COUNT

GRADE LEVEL	TOTAL STUDIES	FAVOR SMALL	NEITHER	FAVOR LARGE	RATIO SMALL/LARGE	PERCENT FAVOR SMALL
K-3	2	1	0	1	1:1	50.0%
4-8	2	1	0	1	1:1	50.0
9-12	6	1	4	1	1:1	16.7
GENERAL STUDIES	8	6	2	0	6:0	75.0

SUMMARY
CLUSTER 11 -- CLASS SIZE AND DISADVANTAGED OR ETHNIC STUDENTS

- Of the 55 studies dealing with relationships between class size and student achievement in grades K-12, 13 indicated that a significant portion of the participating students were either economically disadvantaged or from an ethnic minority. These 13 studies yielded 15 grade-level comparisions.
- In addition, 8 studies that dealt with class size or pupil-teacher ratio as part of a broader analysis are included in this cluster because a significant portion of participating students were economically disadvantaged or from an ethnic minority.
- 10 of the 15 grade-level comparisons (66.7 percent) dealing directly with class size and achievement of disadvantaged or ethnic students found that the academic achievement of these pupils was higher in smaller classes.
- Six of the 8 general studies found that increased pupil achievement for disadvantaged or ethnic minority pupils tended to increase as pupil-teacher ratios decreased.
- In grades K-3, 5 of the 9 studies found pupil achievement higher in smaller classes, one found found achievement higher in larger classes, and 3 studies found no significant differences.
- In grades 4-8, 4 of the 5 available studies concerned with class size and achievement of disadvantaged or ethnic students found achievement higher in smaller classes than in larger classes.
- In grades 9-12, only one study was reported; it was a correlational analysis of the achievement of 12th-grade black students for whom *Project Talent* data were available. The study found smaller classes to be related to increased student achievement test scores in reading and general academic ability, but not in mathematics.

STUDY COUNT

GRADE LEVEL	TOTAL STUDIES	FAVOR SMALL	NEITHER	FAVOR LARGE	RATIO SMALL/LARGE	PERCENT FAVOR SMALL
K-3	9	5	3	1	5:1	55.6%
4-8	5	4	1	0	4:0	80.0
9-12	1	1	0	0	1:0	100.0
GENERAL STUDIES	8	6	2	0	6:0	75.0

SUMMARY
CLUSTER 12 -- CLASS SIZES OF 22 STUDENTS OR LESS

- Of the 55 studies composing the data base on class size and student achievement, 24 (43.6 percent) concerned the effects of class sizes of 22 students or fewer on student achievement in grades K-3, 4-8, or 9-12. Because some studies contained data for more than one grade level, these 24 studies yielded a total of 28 grade-level comparisons.
- 14 of the class size studies involving classes of 22 students or fewer dealt with achievement in grades K-3; 10 dealt with grades 4-8; and 4 dealt with grades 9-12.
- In grades K-3, 10 of the 14 studies (71.4 percent) that were concerned with class size of 22 students or fewer found that pupils in the early primary grades tended to learn more in smaller classes than in larger classes. None of the 14 studies reported finding pupil achievement higher in larger classes.
- All of the 14 studies at the K-3 level dealing with class sizes of 22 students or less pertain to achievement in reading; 10 pertain to mathematics.
- In grades 4-8, 5 of the 10 studies (50.0 percent) that were concerned with class sizes of 22 students or fewer reported finding pupil achievement higher in smaller classes than in larger classes. All but one of the studies at the 4-8 grade level concern pupil achievement in reading, and all but one in mathematics.
- In grades 9-12, only 4 studies were reported dealing with student achievement in class sizes of 22 student or less. None of these 4 studies found student achievement greater in smaller classes; one study found achievement greater in larger classes; and 3 studies found no significant differences in student achievement in smaller and larger classes. Two of the 4 studies included mathematical subjects.

STUDY COUNT

GRADE LEVEL	TOTAL STUDIES	FAVOR SMALL	NEITHER	FAVOR LARGE	RATIO SMALL/LARGE	PERCENT FAVOR SMALL
K-3	14	10	4	0	10:0	71.4%
4-8	10	5	5	0	5:0	50.0
9-12	4	0	3	1	0:1	0.0

CHAPTER 4 SUMMARY

CLASS SIZE AND STUDENT ACHIEVEMENT CLUSTERED BY SUBJECT AREAS AND OTHER FACTORS

This chapter presents the Related Cluster Analysis of class size research pertaining to student achievement in specific subject areas and to other factors that have been studied.

ACHIEVEMENT IN READING AND MATHEMATICS

- Over half of the 55 class size studies dealing with pupil achievement in grades K-12 conducted from 1950 to 1985 concerned relationships between class size and student achievement in reading and mathematics.
- Almost 6 in 10 of the 38 grade-level comparisons in reading achievement contained in these studies pertain to reading achievement in grades K-3.
- One half of all studies with K-3 grade-level comparisons found reading achievement greater in smaller classes than in larger classes. The ratio of study findings favoring increased reading achievement in smaller classes (11) versus larger classes (2) was 5.5 to 1. (Nine studies found no difference.)
- In grades 4-8, one-third of the comparisons (5) found reading achievement greater in smaller than in larger classes; 2 studies found larger classes better, for a ratio of 2.5 to 1. (Seven studies found no difference.)
- One half of the 55 class size studies concern achievement in mathematics. Five of the 14 studies providing comparisons in grades K-3 found pupil achievement higher in smaller classes than in larger; one study found achievement greater in larger classes. Thus, the ratio favoring smaller classes over larger classes was 5 to 1. (Eight studies found no difference.)
- In grades 4-8, 40 percent of the studies (6) found pupil achievement in mathematics greater in smaller classes and 2 found achievement greater in larger classes, for a ratio of 3 to 1. (Six studies found no significant differences.)
- In grades 9-12, of the 7 studies concerned with student achievement in mathematics, none found greater achievement in smaller classes.
- Major differences occurred in the definitions of smaller and larger classes among the studies involving achievement in reading and in mathematics. Definitions of smaller classes ranged from a low of 5 pupils to a high of 40 pupils, and for larger classes from a low of 22 pupils to a high of 192 pupils (with two teachers).

(continued)

CHAPTER 4 SUMMARY (CONTINUED)

CLASS SIZE AND STUDENT ACHIEVEMENT

CLUSTERED BY SUBJECT AREAS AND OTHER FACTORS

ACHIEVEMENT IN LANGUAGE ARTS

- 15 of 55 research studies (27.3 percent) conducted from 1950 to 1985 concerning the relationships between class size and student achievement in grades K-12 included English or language arts; 80 percent of these 15 studies concerned achievement in grades 4-8 or grades 9-12.
- In grades K-3, 1 of 4 studies found achievement in language arts greater in smaller classes; 3 studies found no significant differences.
- In grades 4-8, 1 of the 7 studies (14.3 percent) reported findings indicating greater achievement in smaller classes than larger, one reported findings favoring larger classes, and 5 found no difference.
- In grades 9-12, 2 of 7 studies reported findings indicating greater achievement in English or language arts in smaller classes, 2 in larger classes, and 3 found no difference.

ACHIEVEMENT IN SCIENCE

- 7 of the 55 research studies conducted from 1950 to 1985 concerning relationships between class size and student achievement in grades K-12 included achievement in some area of science.
- All 7 of the studies reported were in grades 9-12; 1 of the 7 studies indicated that achievement in science was greater in smaller classes (14.3 percent), and one that achievement was greater in larger classes. Five studies found no significant difference in student achievement between small and larger classes. Five studies involved extremely large classes.

ACHIEVEMENT IN OTHER SUBJECTS

- 14 of the 55 studies between 1950 and 1985 in grades K-12 reported the effects of class size on pupil achievement in subjects other than the four areas of reading, mathematics, language arts and science; 7 of these studies concern subject areas in grades 4-8, 8 in grades 9-12 , and 1 in grades K-3.

(continued)

CHAPTER 4 SUMMARY
(CONTINUED)

CLASS SIZE AND STUDENT ACHIEVEMENT CLUSTERED BY SUBJECT AREAS AND OTHER FACTORS

- Of the 14 studies, 4 reported findings indicating increased achievement in smaller classes and 10 (64.3 percent) reported finding no significant differences in student achievement between smaller and larger classes.

ACADEMIC ABILITY AND ACHIEVEMENT

- Of the 55 studies dealing specifically with relationships between class size and student achievement in grades K-12, 9 involved an analysis of factors that indicate the level of academic ability of students engaged in the study. In addition, 8 general studies provided some indication of the relationship between the academic ability of students and achievement relative to class size or pupil/teacher ratio.
- In grades K-3, only 2 studies reported findings; both of these concerned reading and mathematics achievement among first-grade pupils. One of these, an experimental study, found achievement for lower-ability pupils higher in smaller classes; the other, a correlational study, found achievement higher in larger classes.
- In grades 4-8, the only 2 studies available also reported conflicting findings regarding the achievement of pupils of lower academic ability in smaller and larger classes.
- In grades 9-12, 6 studies reported mixed results; there are some indications, however, that smaller classes can be beneficial to lower-achieving students, at least in the areas of English and language arts. Also, there is evidence that lower-achieving students in life and physical sciences do better in larger classes with a *highly qualified teacher*.
- Six of the 8 general studies found that in population or school groups typically having lower average academic achievement, achievement tended to increase as class size or pupil/teacher ratio decreased.
- The limited research available tends to indicate that students of lesser academic ability achieve more in smaller classes. The evidence is mixed concerning students of average or higher academic abilities.

(continued)

CHAPTER 4 SUMMARY (CONTINUED)

CLASS SIZE AND STUDENT ACHIEVEMENT CLUSTERED BY SUBJECT AREAS AND OTHER FACTORS

DISADVANTAGED OR ETHNIC STUDENTS

- Of the 55 studies dealing specifically with the relationships between class size and student achievement in grades K-12, 13 indicated that a significant proportion of the participating students were either economically disadvantaged or from an ethnic minority. In addition, 8 general studies dealt with either class size or pupil/teacher ratio factors.
- 10 of the 15 grade-level comparisons (66.7 percent) dealing directly with class size and achievement of disadvantaged or ethnic students found that academic achievement of the pupils was higher in smaller classes.
- Six of 8 general studies found that pupil achievement for disadvantaged or ethnic minority pupils tended to increase as pupil/teacher ratios decreased.
- In grades K-3, 5 of the 9 studies found increased pupil achievement in smaller classes.
- In grades 4-8, 4 of the 5 available studies concerned with class size and the achievement of disadvantaged or ethnic students found achievement higher in smaller classes than in larger classes.

- In grades 9-12, only one study was reported; it is a correlational analysis of *Project Talent* data which reports finding a relationship between smaller classes and increased achievement-test scores in reading and general academic ability for 12th-grade black students, but not in mathematics.

CLASSES OF 22 STUDENTS OR LESS

- A total of 24 studies were reported between 1950 and 1985 that concerned the effects of class sizes of 22 pupils or less on student achievement in grades K-12. These studies are 43.6 percent of the 55 studies comprising the data base on class size and student achievement.
- 14 of the 24 studies involving classes of 22 pupils or less dealt with pupils in grades K-3, and 10 in grades 4-8.

(continued)

CHAPTER 4 SUMMARY
(CONTINUED)

CLASS SIZE AND STUDENT ACHIEVEMENT

CLUSTERED BY SUBJECT AREAS AND OTHER FACTORS

- In grades K-3, 10 of the 14 studies (71.4 percent) found that pupils in the early primary grades tended to learn more in smaller classes than in larger classes. All of the 14 studies dealt with achievement in reading; 10 dealt with achievement in mathematics.
- In grades 4-8, 5 of the 10 studies (50.0 percent) reported finding pupil achievement higher in smaller classes than larger. All but 1 of the 10 studies concerned achievement in reading and mathematics.
- In grades 9-12, only 4 studies have been reported that dealt with student achievement in class sizes of 22 students or less. None of these found student achievement greater in smaller classes; one found achievement greater in larger classes. Two of the four studies included mathematical subjects.

SUMMARY
CLUSTER 13 -- THE EFFECTS OF CLASS SIZE ON TEACHING PRACTICES

This cluster of studies has focused on the effects of class size on teaching practices.

- 13 of the 22 studies contained in this cluster favored smaller classes. Teachers in smaller classes were found to use more desirable classroom practices such as greater variety of classroom techniques, more attention to individual students, and more individualization of instruction. However, some of these studies were criticized for relying solely on input measures that had not been validated in terms of outcome measures of student learning.
- 9 of the 22 studies found no significant difference in teaching practices between smaller and larger classes.
- Of the 9 studies that used specific observational instruments or items such as "A Guide for Observation," "Indicators of Quality," or similar instruments to measure differences in the quality of the classroom climate and teaching practices, 8 found smaller classes more favorable. One found no significant difference between smaller and larger classes. Some observer guides and indicators used in these studies were criticized for being subjective and biased in favor of small classes.
- Among the 9 studies that also used direct classroom observations but different types of measuring instruments, 6 found no significant difference in teaching practices in smaller and larger classes. Three found teachers in smaller classes using more desirable practices.
- 4 of the 22 studies were experimental studies in which control groups were used: Fox (1967), Taylor and Fleming (1972), Wright and other (1977), and Whittington and others (1985).
  - » The experimental study reported by Fox provided smaller classes for teachers as part of a broader program to improve educational quality, but observers found that

(continued)

SUMMARY
CLUSTER 13 -- EFFECTS OF CLASS SIZE ON TEACHING PRACTICES (CONTINUED)

55 percent of the teachers who were provided smaller classes did not effectively take advantage of their smaller class to individualize instruction.

» In the three-year experimental study reported by Taylor and Fleming in which teachers' class sizes were reduced and teachers were provided with additional training and resources, classroom observations showed that teachers gave more individual attention to students and made better use of resources. But measures of pupil achievement in reading and mathematics were mixed between increases and decreases across grade levels 2-6.

» In the two-year study by Wright and others in which the same teachers were observed both before and after their classes were reduced in size, observers found no significant differences in their teaching practices between their earlier large class and later small class. However, the teachers believed that they had made favorable changes in teaching practices when their classes were reduced.

» Whittington and others, in their study, looked at the classroom environment and teaching practices of first-grade teachers whose classes were reduced in size by analyzing logs kept by teachers in the experimental classes. An analysis of log entries revealed areas of favorable change such as more pupil participation, more feedback to pupils, and faster pace of learning. However, the authors observe that the teachers' reported favorable changes may only have been the result of teachers having kept logs. (Teachers in the control classes did not keep logs.)

- In general, the studies in this cluster indicate that smaller classes tend to promote the use of desirable teaching practices; however, smaller classes do not guarantee that teachers will adapt their teaching practices to take advantage of the smaller classes.

(continued)

SUMMARY
CLUSTER 13 -- EFFECTS OF CLASS SIZE ON TEACHING PRACTICES (CONTINUED)

- Research indicates that many teachers whose classes are reduced in size do not change their teaching techniques to take advantage of the smaller classes.
- The research emphasizes the basic importance of high quality in the teaching staff if small classes are to produce the kinds of results that are to be expected.
- Some research has indicated the importance of teachers being made aware of pending changes -- either decreases or increases -- in class size policy and provided with additional preparation and assistance in adapting their teaching practices to optimize the new learning conditions.

SUMMARY
CLUSTER 14 -- CLASS SIZE, INSTRUCTIONAL METHODS, AND LEARNING INTERVENTIONS

This related cluster of research summarizes the findings of studies that have identified and validated teaching methods and conditions that are conducive to improved student learning, indicating the relative effects of class size.

Bloom and Associates (1984)

The class size research of Benjamin S. Bloom (1984) and his students is unique. Most class size research attempts to hold teaching methods constant and to vary class size in an effort to find differences in student learning. Bloom's approach is to hold class size contant at 30 pupils and vary instructional methods and other factors to find ways of raising student learning to match levels found in one-to-one tutoring.

Bloom and his students have searched for teaching-learning conditions that would enable the majority of students in classes of 30 pupils to attain the high level of achievement found under good tutoring conditions. They call their research the search for solutions to the "2 sigma" problem.

These studies compared student learning at different grade levels and in different subjects -- under 1) conventional instruction in a class of 30 pupils, 2) mastery learning instruction in a class of 30, and 3) one-to-one tutoring -- and found great differences in student cognitive achievement, attitude, and self-concept under tutoring as compared with the other two methods of instruction.

Ninety percent of the students in the one-to-one tutoring and 70 percent of the students in the mastery learning classes of 30 pupils attained the level of summative achievement reached by only the highest 20 percent of the students taught under conventional instruction in a class of 30 pupils. Variations were also found in students' time-on-task in the three learning conditions--

(continued)

SUMMARY
CLUSTER 14 -- CLASS SIZE, INSTRUCTIONAL METHODS, AND LEARNING INTERVENTIONS (CONTINUED)

65 percent on-task under conventional instruction, 75 percent under mastery learning instruction, and more than 90 percent under one-to-one tutoring.

Bloom concluded that large numbers of teachers can use the feedback-corrective procedures of mastery learning in conventional size classes to achieve the "1 sigma" effect -- that is, the average mastery learning student is above 84 percent of the students taught under conventional instruction.

Walberg (1984)

Herbert Walberg and his associates examined nearly 3,000 studies, searching for various factors related to educational productivity. This research has identified nine factors that must be optimized in order to increase student learning. These are grouped into three major categories: student aptitude, instruction, and environment.

Instructional methods with the largest effects on learning were found to be: reinforcement, acceleration, reading training, and clues and feedback. Walberg noted that the components of mastery learning (reinforcement, and clues and feedback) ranked first and fourth in their effects on educational outcomes.

Those conditions with small effects on student learning were found to be: class size, and homogeneous groups. Programmed instruction and mainstreaming had negative effects.

Referring to the low effects of class size on student learning, Walberg stated: "Reduced class size, for example, has small positive effects but is expensive and draws money and effort away from factors with large effects." [90:23]

(continued)

SUMMARY
CLUSTER 14-- CLASS SIZE, INSTRUCTIONAL METHODS, AND LEARNING INTERVENTIONS (CONTINUED)

In synthesizing the effects that supportive and supplementary factors have on student learning, he found "graded homework" almost three times as effective in improving student learning as was "assigned homework" that was ungraded.

What Walberg termed the "alterable curriculum of the home" was twice as productive of academic learning as was family socio-economic status.

Cooperative learning, personalized instruction, and adaptive instruction were found to be five to six times more effective in promoting learning than was the size of class.

Walberg encourages the selective reading of research syntheses and studies for a more complete understanding of the specific factors and methods pertaining to increased educational productivity.

Levin, Glass, and Meister (1984)

Levin, Glass, and Meister, using an education production function approach, analyzed the relative cost-effectiveness of four instructional interventions in improving student learning in mathematics and reading in the early primary grades: lowering class size, computer-assisted instruction, increased instructional time, and tutoring (peer, adult, and combination of both).

A computer model was used to project the relative effectiveness of each instructional intervention for improving pupil achievement in reading and mathematics. The statistical measure "effect size" was used to gauge the learning effectiveness of the intervention.

According to the authors, the analysis indicated that using peer tutoring (upper elementary grade students tutoring pupils

(continued)

SUMMARY
CLUSTER 14-- CLASS SIZE, INSTRUCTIONAL METHODS, AND LEARNING INTERVENTIONS (CONTINUED)

in grades 2 and 3) was over four times as effective in improving pupil achievement in mathematics as a reduction in class size from 35 to 20 pupils.

Although the magnitudes of the effect sizes are less in reading than in mathematics, the effect size for use of peer tutors in reading is still four times that of reducing class size from 35 to 20 pupils.

The effect size for computer-assisted instruction in mathematics is about one-half that shown for reducing class size from 30 to 20 pupils; in reading, the effect size shown for computer-assisted instruction is about twice that of reducing class size. Very small effect sizes were found for increasing the instructional time for both mathematics and reading.

Later in their report, the authors take these effect sizes and convert them into cost-effectiveness comparisons for each of the four interventions. This second step (cost-effectiveness in dollar terms) is described in Chapter 7 of this ERS Research Brief, which deals with the cost implications of changing class size policies.

SUMMARY
CLUSTER 15 -- CLASS SIZE AND PUPIL BEHAVIOR AND ATTITUDES

- Of the 15 studies dealing with a relationship between class size and student behavior and attitudes, 10 dealt specifically with these factors while 5 focused on measures of these components in the context of class size and student achievement.
- Particular aspects of student behavior and attitudes studied include degree of aggressiveness, number of pupil-teacher contacts, and attitudes toward subject matter, with each of the studies concentrating on different measures.
- 7 of the 17 grade-level comparisons dealing with class size and student behavior and attitudes found these to be more positive in smaller classes; the remainder found no difference between smaller and larger classes. None of the studies in this cluster found a positive effect related to larger classes.
- Of the 6 studies conducted in the primary grades (K-3), 4 found a relationship between smaller classes and positive student attitudes or behavior.
- In grades 4-8, 1 of the 3 studies identified a positive relationship between smaller classes and student attitudes. The other 2 studies found no difference.
- 2 of the 8 studies reported for grades 9-12 found student attitudes to be more positive in smaller classes. Six found no difference.

STUDY COUNT

GRADE LEVEL	TOTAL STUDIES	FAVOR SMALL	NEITHER	FAVOR LARGE	RATIO SMALL/LARGE	PERCENT FAVOR SMALL
K-3	6	4	2	0	4:0	66.7%
4-8	3	1	2	0	1:0	33.3
9-12	8	2	6	0	2:0	25.0

SUMMARY
CLUSTER 16 -- TEACHER OPINION REGARDING CLASS SIZE

- Of the 10 national studies that focused on teacher opinion regarding class size, 7 identified positive teacher attitudes toward smaller classes. Large classes were identified as a serious problem, although generally falling below concerns about salary level.
- Of the 8 grade-level comparisions contained in local studies, 5 found positive teacher attitudes to be related to smaller class sizes. Two of these studies found participating teachers willing to accept a lower salary if doing so meant having smaller classes.
- In grades K-3, 2 of the 4 studies identified smaller class size as a contributor to high teacher morale and feelings of effectiveness.
- At the grade 4-8 level, 1 of the 2 studies related smaller classes to more positive teacher attitudes. The other study found no difference between smaller and larger classes from the standpoint of general teacher morale, but teachers in smaller classes did have more positive perceptions of their own effectiveness.
- Both of the 2 teacher attitude and class size studies conducted at the 9-12 level found smaller classes to be related to more positive teacher attitudes.

STUDY COUNT

GRADE LEVEL	TOTAL STUDIES	FAVOR SMALL	NEITHER	FAVOR LARGE	RATIO SMALL/LARGE	PERCENT FAVOR SMALL
National Studies						
K-12	10	7	3	0	7:0	70.0%
Local Studies						
K-3	4	2	2	0	2:0	66.7%
4-8	2	1	1	0	1:0	50.0
9-12	2	2	0	0	2:0	100.0

APPENDIX B34

SUMMARY
CLUSTER 17 -- PUBLIC OPINION REGARDING CLASS SIZE

Public Opinion Concerning Problems Facing The Public Schools, 1972-1977

For the years 1972-1977, results of the *Gallup Poll of Public Attitudes Toward Education* provide a gauge of public concern about class size as compared to other problems facing the public schools. During this period, the public consistently ranked the problems of discipline, finance, and integration/segregation high on the list, while the rank of "size of school/classes" ranged from fourth to seventh. The percent of the respondents considering "size of school/classes" a significant problem varied from 10 percent in 1972 and 1975 to 5 percent in 1976 and 1977.

The source of the data is the annual *Gallup Poll of Public Attitudes Toward Education* as reported each year in *Phi Delta Kappan*. The text of the question reads -- "What do you think are the biggest problems with which the community must deal?", with the "school/class size" option included only for the years 1972-1977. Problems receiving a response rate of 3 percent or more appear in this table, with the categories "miscellaneous," "there are no problems," and "don't know/no answer" listed after actual problem areas.

1972

Discipline (23%)
Finances (19%)
Integration/segregation (18%)
Teachers (14%)
Large school/large classes (10%)
Parents' lack of interest (6%)
Curriculum (5%)
Facilities (5%)
Dope, drugs (4%)
Miscellaneous (9%)
There are no problems (2%)
Don't know/no answer (12%)

OPTIONS PROVIDED: 12

1973

Lack of discipline (22%)
Integration/segregation (18%)
Lack of proper financial support (16%)
Difficulty in getting good teachers (13%)
Use of drugs (10%)
Size of school/classes (9%)
Poor curriculum (7%)
Lack of proper facilities (4%)
Parents' lack of interest (4%)
School board policies (4%)
Pupils' lack of interest (3%)
Miscellaneous (4%)
There are no problems (4%)
Don't know (13%)

OPTIONS PROVIDED: 16

(continued)

APPENDIX B35

SUMMARY
CLUSTER 17 -- PUBLIC OPINION REGARDING CLASS SIZE (CONTINUED)

1974

Lack of discipline (23%)
Integration/segregation problems (18%)
Lack of proper financial support (13%)
Use of drugs (13%)
Difficulty in getting good teachers (11%)
Size of school/classes (6%)
Parents' lack of interest (6%)
School board policies (4%)
Poor curriculum (3%)
Lack of proper facilities (3%)
Miscellaneous (4%)
There are no problems (3%)
Don't know/no answer (17%)

OPTIONS PROVIDED: 15

1975

Lack of discipline (23%)
Integration/segregation/busing (15%)
Difficulty in getting good teachers (11%)
Size of school/classes (10%)
Use of drugs (9%)
Poor curriculum (5%)
Crime/vandalism/stealing (4%)
Lack of proper facilities (3%)
Pupils' lack of interest (3%)
Miscellaneous (12%)
There are no problems (5%)
Don't know/no answer (10%)

OPTIONS PROVIDED: 15

1976

Lack of discipline (22%)
Integration/segregation/busing (15%)
Lack of proper financial support (14%)
Poor curriculum (14%)
Difficulty in getting good teachers (11%)
Use of drugs (11%)
Size of school/classes (5%)
Parents' lack of interest (5%)
Pupils' lack of interest (3%)
School board policies (3%)
Miscellaneous (8%)
There are no problems (3%)
Don't know/no answer (12%)

OPTIONS PROVIDED: 16

1977

Lack of discipline (26%)
Integration/segregation/busing (13%)
Lack of proper financial support (12%)
Difficulty in getting good teachers (11%)
Poor curriculum (10%)
Use of drugs (7%)
Size of school/classes (5%)
Parents' lack of interest (5%)
Teachers' lack of interest (5%)
Mismanagement of funds/programs (4%)
Pupils' lack of interest (3%)
Miscellaneous (5%)
There are no problems (4%)
Don't know/no answer (16%)

OPTIONS PROVIDED: 23

SUMMARY
CLUSTER 18 -- COST EFFECTS OF CLASS SIZE CHANGES

This related cluster of information contains descriptions of 3 studies of the cost effects of class size changes plus examples of the nature of the considerations and the magnitude of costs associated with specific changes in class size policies in 7 states and 6 local school districts.

- The element of financial realism is fundamental to the success of any class size policy change. Many class size reduction policies that seemed educationally sound and politically popular at the time of adoption quickly ran into trouble when faced with the costs of initiating and maintaining the reductions in class size.
- The cost-effectiveness of class size reductions in improving student achievement varies by both grade level and subject area.
- There is evidence that in the early primary grades (K-2) additional funds spent to reduce class size can be more cost-effective in increasing pupil achievement in reading and mathematics than funds spent to hire teachers with additional college degrees or years of teaching experience. There is also some evidence that the use of peer tutors can be more cost-effective in increasing pupil achievement than reductions in class size.
- In the late primary grades (3-5), there is evidence that allocating additional funds to reduce class size is less cost-effective in improving pupil achievement than allocating the same funds to improve the college training of teachers, but allocating the additional funds to improve the training of school principals was found to be even more cost-effective in improving student achievement.
- In the secondary grades, there is as yet no research evidence that reducing class size within reasonable ranges is cost-effective in improving student achievement. There is some evidence that money spent for upgrading the training of teachers can be cost-effective in improving student achievement in the secondary grades.

(continued)

SUMMARY
CLUSTER 18 -- COST EFFECTS OF CLASS SIZE CHANGES (CONTINUED)

- Researchers have cautioned that the statistical models used in these analyses may be oversimplified with many variables omitted and many interactions ignored. Thus, policy makers should view the results with caution and consider them as only tentative until further research is available.
- Examples of the cost implications of changes in class size policies included here show some of the major impacts that even small changes in class size policy can have on funding priorities in a state or local school district.
- These examples also show the substantial differences in the estimated cost of the same proposed class size reduction, depending on the assumptions used in making the estimates.
- Research evidence does not justify, in terms of increased student learning, an absolute limitation on class size in isolation of the many other factors and demands on school resources.

Taken from "How Do We Stack Up?" -- A Utah Public Education Report by the Governor's Task Force on Educational Data Dec.'89

Demographics

School enrollments in Utah have been growing rapidly over the past 25 years while declining in most other states. Over the past 10 years (1978-88), public school enrollments in Utah rose by 32% to a total of 429,551. When compared with a reduction of 6% in the nation as a whole, this has placed Utah at a disadvantage in attempting to keep pace with other states.

If present trends continue, school enrollments in Utah should level off by 1993 and then begin to decline for a few years (Figure 1-1). Although the rapid increase in enrollments have been the main cause for Utah's educational problems, a potential benefit is an increasing number of high-school graduates who will provide the state with a large, well-educated work force at a time when many areas in the nation will be facing serious labor shortages.

The average class size in Utah has remained fairly constant. In 1988-89, there was an average of 24.9 pupils for every classroom teacher in Utah schools (Figure 1-2). This number is based on students per classroom teachers only and does not include resource or other teachers. This was about the same pupil-teacher ratio that existed fifteen years earlier and 17% less than the average pupil-teacher ratio of 28.1 that existed in 1963-64. The main area of controversy in class size is that Utah has not kept pace with the decline in the average class size that has occurred nationally.

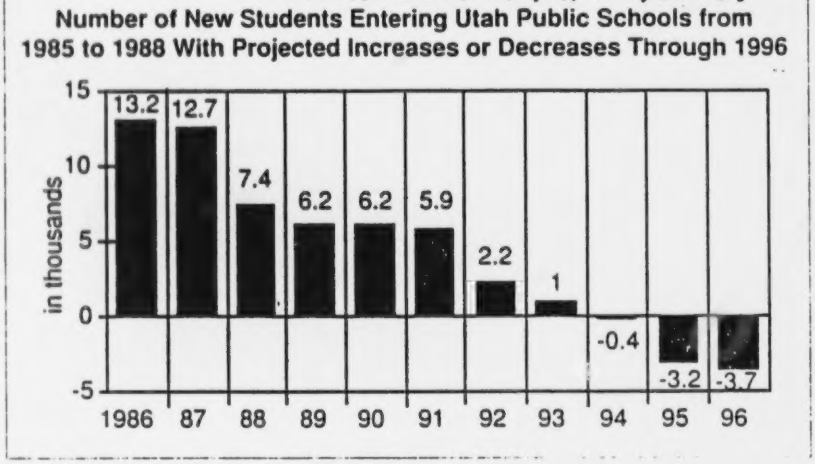

Number of New Students Entering Utah Public Schools from 1985 to 1988 With Projected Increases or Decreases Through 1996

Figure 1-1

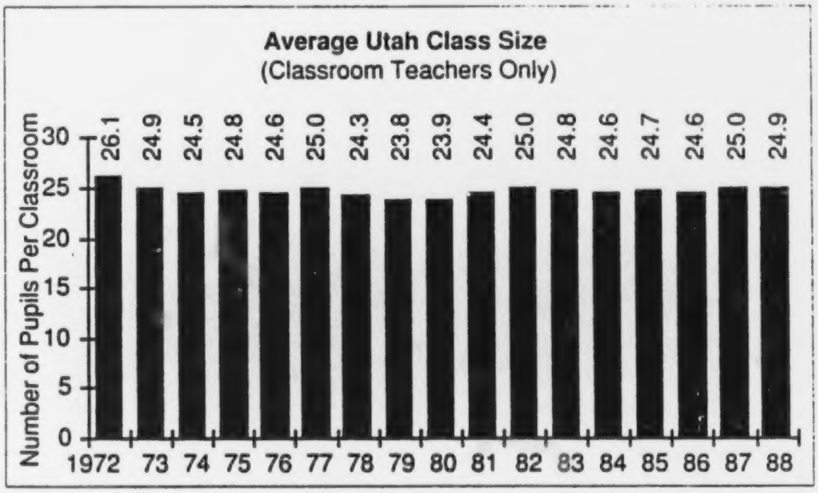

Average Utah Class Size
(Classroom Teachers Only)

Figure 1-2

The cost of reducing the average class size in Utah would be substantial (Figure 1-4). To bring the average class size in Utah down from 24.9 to the national average of 17.5 pupils per class, the cost would be approximately $130,984,285. This amount does not include the added capital expenditures required to produce additional classroom space.

Estimated Amount to Reduce Pupil-Teacher Ratio by One

Grades	Salary and Benefits
K-3	$5,177,799
4-6	$3,540,743
7-12	$8,982,036
Total cost to reduce all classes by one pupil per class	$17,700,579

Figure 1-4

Number of Schools in Utah

Elementary Schools: 440
Middle and Jr. High Schools: 115
High Schools: 99
Special Schools: 75

Figure 1-3

APPENDIX D

Taken from "Summary of Statistical and Financial Data" USOE, 1987-8

1987-88 PUPIL-TEACHER RATIOS
INTERNS INCLUDED

		ELEMENTARY			MIDDLE	SECONDARY				
NO. DISTRICT	TOTAL ADM*	KINDER-GARTEN	GRADES 1 - 6	K-6 WITH K-WEIGHTED	GRADES 4 - 10	GRADES 7 - 12	GRADES 1 - 12	K - 12 WITH K-WEIGHTED	SPECIAL EDUCATION	SPEC. ED & K - 12 WITH K-WEIGHTED
01 ALPINE	36,243	57.20	24.84	25.29		24.71	24.78	25.05	20.79	24.94
02 BEAVER	1,346	49.63	25.63	25.73		20.72	23.12	23.26		23.26
03 BOX ELDER	10,240	52.88	27.99	28.09	26.06	23.96	26.24	26.38	19.88	26.23
04 CACHE	11,694	58.09	28.15	28.48	23.54	27.02	26.56	26.78	23.03	26.70
05 CARBON	5,377	47.72	24.62	24.76	26.04	21.74	23.57	23.68	9.80	23.03
06 DAGGETT	177	23.98	17.08	16.37		9.43	12.52	12.55		12.55
07 DAVIS	50,358	50.04	27.42	27.43		23.86	25.76	25.84	20.75	25.71
08 DUCHESNE	4,387	46.21	23.52	23.70	27.00	21.95	23.40	23.48	25.83	23.56
09 EMERY	3,459	45.82	22.96	23.14		20.24	21.74	21.90		21.90
10 GARFIELD	1,064	46.01	25.73	25.66	15.42	15.45	19.37	19.59		19.59
11 GRAND	1,457	55.55	27.08	27.36	22.93	17.35	22.57	22.83	33.00	23.00
12 GRANITE	73,339	49.40	26.57	26.62		24.28	25.53	25.61	14.68	25.22
13 IRON	5,119	56.51	26.71	27.06	24.73	21.34	24.44	24.69	15.00	24.50
14 JORDAN	61,731	56.11	27.28	27.54		17.18	25.09	25.32	12.92	24.84
15 JUAB	1,467	65.62	26.60	27.36	31.18	19.11	24.98	25.38	10.57	24.48
16 KANE	1,397	47.56	27.36	27.20	24.64	32.44	28.13	28.02	3.42	26.33
17 MILLARD	3,651	52.47	26.82	27.06	27.92	16.90	23.39	23.63		23.63
18 MORGAN	1,693	23.59	25.85	23.00	26.78	17.42	22.86	22.06		22.06
19 NEBO	15,752	56.26	29.65	29.77	45.41	22.33	27.76	27.90	23.50	27.82
20 NO SANPETE	2,228	47.61	26.05	26.04	22.50	25.90	25.08	25.13	12.00	24.68
21 NO SUMMIT	876	35.52	22.60	22.23	25.60	15.61	21.00	20.92	7.00	20.58
22 PARK CITY	1,466	40.37	20.61	20.80	19.08	18.81	19.40	19.51	33.00	19.72
23 PIUTE	357	22.38	17.37	16.77		16.59	16.91	16.67		16.67
24 RICH	517	27.28	21.92	21.17		12.93	17.21	17.08		17.08
25 SAN JUAN	3,368	25.84	21.02	20.24	21.16	16.25	18.73	18.49	17.75	18.48
26 SEVIER	4,609	57.27	27.62	27.93	25.34	22.48	25.41	25.64		25.64
27 SO SANPETE	2,436	45.89	25.12	25.12	23.79	20.86	23.39	23.46	8.40	22.74
28 SO SUMMIT	975	36.28	22.61	22.35	20.36	18.35	20.65	20.62		20.62
29 TINTIC	202	34.02	12.02	12.44		13.64	12.96	13.12	14.28	13.13
30 TOOELE	7,233	46.59	27.02	26.88	26.10	20.75	23.93	24.00	10.75	23.42
31 UINTAH	6,171	46.14	27.28	27.07	20.80	20.70	23.74	23.82	29.07	23.96
32 WASATCH	2,869	48.14	28.47	28.25	24.64	22.29	25.55	25.59	15.85	25.06
33 WASHINGTON	11,453	61.26	30.11	30.39	31.33	27.71	29.75	29.92	40.00	30.03
34 WAYNE	600	39.74	21.50	21.53	18.88	19.05	20.07	20.13	1.73	18.77
35 WEBER	24,718	50.85	25.81	25.98		28.65	27.03	27.07	43.64	27.34
36 SALT LAKE	24,388	49.43	25.06	25.26		21.08	22.55	22.78	13.72	22.29
37 OGDEN	11,560	40.37	22.65	22.60	25.09	19.43	22.15	22.15	15.64	21.83
38 PROVO	12,751	51.49	28.83	28.78		40.46	27.91	27.93	12.28	26.73
39 LOGAN	5,065	56.31	27.56	27.95	21.22	23.34	24.68	25.02		25.02
40 MURRAY	6,006	51.62	24.28	24.62		23.22	23.81	24.02	14.25	23.70
TOTALS	419,799	50.82	26.46	26.59	29.91	22.62	25.04	25.17	16.88	24.90

*ADM does not include students attending out-of-state

1987-88 PUPIL-TEACHER RATIOS
INTERNS AND RESOURCE TEACHERS INCLUDED

		ELEMENTARY			MIDDLE	SECONDARY				
NO. DISTRICT	TOTAL ADM*	KINDER-GARTEN	GRADES 1 - 6	K-6 WITH K-WEIGHTED	GRADES 4 - 10	GRADES 7 - 12	GRADES 1 - 12	K - 12 WITH K-WEIGHTED	SPECIAL EDUCATION	SPEC. ED & K - 12 WITH K-WEIGHTED
01 ALPINE	36,243	57.20	22.47	23.03		23.25	22.80	23.12	20.79	23.06
02 BEAVER	1,346	49.63	22.24	22.54		19.82	21.06	21.26		21.26
03 BOX ELDER	10,240	52.88	25.10	25.43	24.62	22.29	23.86	24.10	19.88	24.01
04 CACHE	11,694	58.09	25.47	25.99	21.95	25.88	24.34	24.63	23.03	24.60
05 CARBON	5,377	47.72	21.92	22.25	23.87	20.39	21.22	21.41	9.80	20.92
06 DAGGETT	177	23.98	15.18	14.84		9.05	11.64	11.73		11.73
07 DAVIS	50,358	50.04	25.35	25.52		22.38	23.61	23.78	20.75	23.71
08 DUCHESNE	4,387	46.21	21.61	21.94	25.13	20.47	21.56	21.71	25.83	21.83
09 EMERY	3,459	45.82	20.98	21.29		19.05	20.13	20.35		20.35
10 GARFIELD	1,064	46.01	22.22	22.45	13.50	15.45	17.93	18.18		18.18
11 GRAND	1,457	55.55	23.96	24.42	21.43	16.55	20.78	21.08	33.00	21.26
12 GRANITE	73,339	49.40	24.63	24.84		23.00	23.47	23.64	14.68	23.34
13 IRON	5,119	56.51	24.77	25.24	23.50	20.56	22.96	23.25	15.00	23.10
14 JORDAN	61,731	56.11	25.53	25.90		16.13	23.04	23.32	12.92	22.94
15 JUAB	1,467	65.62	24.77	25.61	28.11	17.68	23.05	23.49	10.57	22.76
16 KANE	1,397	47.56	26.66	26.59	22.81	32.44	27.22	27.16	3.42	25.58
17 MILLARD	3,651	52.47	22.56	23.20	24.75	15.53	20.63	20.95		20.95
18 MORGAN	1,693	23.59	24.34	21.94	25.53	16.73	21.77	21.09		21.09
19 NEBO	15,752	56.26	26.56	26.94	42.71	20.77	25.41	25.64	23.50	25.61
20 NO SANPETE	2,228	47.61	23.12	23.37	21.46	23.70	22.60	22.75	12.00	22.42
21 NO SUMMIT	876	35.52	20.75	20.62	24.38	15.03	19.78	19.77	7.00	19.47
22 PARK CITY	1,466	40.37	19.52	19.86	17.83	17.11	18.04	18.20	33.00	18.40
23 PIUTE	357	22.38	14.63	14.38		15.91	15.35	15.20		15.20
24 RICH	517	27.28	19.65	19.18		12.50	16.04	15.97		15.97
25 SAN JUAN	3,368	25.84	19.50	18.93	19.06	15.49	17.55	17.39	17.75	17.39
26 SEVIER	4,609	57.27	24.32	24.83	23.52	21.30	23.00	23.28		23.28
27 SO SANPETE	2,436	45.89	23.32	23.47	23.00	20.86	22.43	22.54	8.40	21.89
28 SO SUMMIT	975	36.28	21.05	20.95	18.66	17.13	19.16	19.20		19.20
29 TINTIC	202	34.02	11.35	11.79		13.29	12.46	12.63	14.28	12.64
30 TOOELE	7,233	46.59	24.40	24.51	23.61	19.44	21.84	22.00	10.75	21.54
31 UINTAH	6,171	46.14	24.05	24.18	18.78	17.52	20.68	20.89	29.07	21.08
32 WASATCH	2,869	48.14	26.71	26.68	23.02	22.29	24.26	24.36	15.85	23.92
33 WASHINGTON	11,453	61.26	27.39	27.83	28.82	25.64	27.23	27.50	40.00	27.62
34 WAYNE	600	39.74	20.80	20.89	18.88	19.05	19.78	19.86	1.73	18.53
35 WEBER	24,718	50.85	22.40	22.78		24.93	23.44	23.62	43.64	23.91
36 SALT LAKE	24,388	49.43	22.45	22.85		20.11	20.85	21.14	13.72	20.76
37 OGDEN	11,560	40.37	21.02	21.14	23.23	18.77	20.45	20.54	15.64	20.32
38 PROVO	12,751	51.49	24.93	25.22		37.37	24.86	25.03	12.28	24.15
39 LOGAN	5,065	56.31	25.37	25.96	19.25	21.16	22.19	22.63		22.63
40 MURRAY	6,006	51.62	21.62	22.11		22.07	21.81	22.10	14.25	21.86
TOTALS	419,799	50.82	24.12	24.43	[illegible]	21.20	22.89	[illegible]	16.88	22.93

Table 1—Utah Education Association Elementary Class Size Average Comparisons
1985-1986-1987

School District	Kindergarten			First Grade			Second Grade			Third Grade			Fourth Grade			Fifth Grade			Sixth Grade			Combination Classes			District Average		
	1985	1986	1987	1985	1986	1987	1985	1986	1987	1985	1986	1987	1985	1986	1987	1985	1986	1987	1985	1986	1987	1985	1986	1987	1985	1986	1987
Alpine	28.09	28.52	29.50	28.28	27.89	28.54	28.16	28.57	28.73	29.15	29.04	30.20	30.60	29.77	30.68	29.51	31.47	29.81	30.08	30.59	30.78	27.74	27.27	33.32	28.97	29.25	30.05
Beaver	26.86	32.33	24.50	22.67	21.17	23.20	22.20	25.60	23.25	24.11	26.25	27.00	26.17	35.00	29.00	30.29	30.67	32.67	30.80	29.00	30.67	25.67	32.75	25.17	26.08	28.13	26.34
Box Elder	22.49	26.03	26.57	25.09	24.75	26.47	25.07	26.13	27.26	27.03	27.65	28.89	25.41	28.87	29.17	23.15	28.68	31.00	26.75	25.93	29.85	22.67	25.52	24.20	24.62	26.50	27.53
Cache	28.89	28.89	28.28	25.00	26.50	25.88	25.52	26.03	25.93	28.43	28.87	28.50	29.23	29.55	29.48	29.82	31.43	29.28	-*	-*	-*	20.60	26.38	27.00	27.53	28.31	27.62
Carbon	25.38	24.68	27.00	25.65	25.70	26.05	25.65	25.67	25.91	28.07	25.44	26.95	28.47	26.94	30.06	26.77	31.92	29.28	30.23	30.23	29.71	24.00	25.14	20.00	26.84	26.78	26.96
Daggett	13.00	9.00	13.00	-*	-*	-*	-*	-*	-*	-*	-*	-*	-*	-*	-*	-*	-*	-*	-*	-*	-*	17.33	19.00	16.67	16.25	17.33	15.75
Davis	25.29	24.93	25.23	25.15	25.60	25.29	25.26	25.86	25.41	26.21	26.93	27.18	29.48	29.10	27.93	28.38	29.98	30.22	29.56	29.38	29.45	25.73	24.67	25.26	26.73	27.08	26.85
Duchesne	23.47	23.81	26.17	23.88	23.71	23.25	26.50	22.94	23.40	23.93	25.08	24.07	25.38	27.46	25.57	28.82	28.27	25.75	28.91	29.00	21.80	27.50	26.57	24.60	25.58	25.47	24.28
Emery	26.42	20.93	23.13	22.75	20.82	21.64	23.90	21.38	23.75	23.45	24.67	25.50	26.20	24.83	23.73	23.67	25.91	24.45	23.60	25.60	26.00	-*	25.00	22.25	24.30	23.09	23.78
Garfield	20.67	26.33	18.80	16.67	23.67	16.50	14.75	22.00	21.75	16.33	26.00	17.20	13.67	28.00	19.33	10.00	32.00	19.00	15.33	20.00	4.00	24.00	22.88	19.30	15.24	26.23	18.65
Grand	27.78	28.00	27.25	28.00	28.00	27.50	28.00	24.80	25.00	28.38	26.00	29.33	29.50	28.50	29.75	27.57	26.75	30.75	32.00	-*	-*	29.00	23.00	-*	28.44	26.83	28.22
Granite	25.26	25.40	25.24	25.23	25.41	24.40	25.42	25.66	25.92	26.09	26.40	27.10	29.20	30.39	29.84	29.43	31.01	30.63	29.63	30.50	29.95	27.26	29.16	25.19	26.81	27.39	27.02
Iron	26.83	25.32	26.63	23.80	24.16	26.71	22.75	26.16	27.59	25.15	25.93	29.13	24.63	28.38	25.93	23.53	26.87	27.56	18.50	24.00	18.33	-*	33.00	34.00	24.32	26.06	27.07
Jordan	27.40	27.35	27.93	26.07	26.75	26.11	26.60	27.52	27.52	27.93	28.45	29.04	28.43	28.66	28.17	29.44	27.93	28.57	27.72	29.49	30.63	25.07	28.64	26.85	27.54	27.87	28.13
Juab	27.22	27.80	29.75	24.20	27.00	26.00	23.78	25.00	26.40	28.29	27.20	23.60	33.00	25.25	31.50	29.00	28.25	27.50	27.50	-*	-*	25.50	23.00	10.00	26.94	26.62	26.61
Kane	29.25	29.33	29.00	26.80	25.20	26.33	21.00	29.50	23.75	24.60	22.25	29.25	25.50	24.20	29.33	28.00	25.50	26.00	29.00	32.00	25.00	-*	33.50	27.00	25.71	26.72	27.27
Millard	29.38	28.92	26.62	24.86	28.15	25.23	26.83	28.84	28.00	31.40	28.40	30.00	31.57	31.00	27.80	-*	29.40	-*	-*	34.60	-*	11.00	19.50	30.00	28.31	29.17	27.42
Morgan	26.33	23.20	-*	26.20	25.83	-*	22.80	25.80	-*	26.50	29.25	-*	31.25	26.17	-*	-*	32.33	-*	-*	-*	-*	-*	-*	-*	26.42	26.59	-*
Nebo	26.72	26.92	26.69	25.00	25.31	26.60	25.50	26.38	28.05	25.71	26.78	28.04	29.89	29.64	31.13	30.41	31.37	30.59	31.67	28.25	28.67	26.75	32.80	30.41	26.98	27.59	28.50
North Sanpete	22.89	26.63	23.88	22.25	21.67	24.13	22.86	25.71	26.29	24.14	23.57	25.57	27.00	26.50	28.40	25.83	29.60	26.17	-*	-*	-*	21.00	26.40	24.33	23.76	25.36	25.36
North Summit	23.25	20.75	24.67	25.00	20.00	26.67	22.00	24.25	27.00	27.67	29.33	24.00	24.67	27.33	28.67	-*	22.33	-*	-*	-*	-*	-*	-*	-*	24.33	23.67	26.06
Park City	23.25	-*	20.83	18.40	-*	19.50	18.20	-*	22.80	24.25	-*	23.20	26.50	23.00	-*	-*	23.50	-*	-*	26.00	-*	-*	-*	20.00	21.77	23.55	21.39
Piute	17.50	17.00	-*	16.00	19.00	15.50	22.00	10.00	14.00	17.00	22.00	10.00	18.00	-*	23.00	17.00	-*	-*	17.00	-*	-*	28.00	23.50	19.60	18.69	20.90	17.27
Rich	28.00	19.00	13.67	20.33	22.00	17.33	20.00	17.00	17.33	29.50	17.00	19.33	19.50	24.00	22.00	33.00	11.00	26.50	-*	-*	-*	23.00	-*	-*	23.92	18.33	18.75
San Juan	22.36	21.83	21.23	19.45	22.00	23.31	22.78	20.09	21.56	22.45	23.00	25.62	22.80	23.89	26.46	23.67	25.10	25.50	21.75	21.29	24.80	12.00	13.75	16.18	21.71	21.96	23.15
Sevier	26.41	24.44	28.92	24.00	25.06	26.43	22.95	26.27	27.07	26.59	28.23	27.71	26.86	30.31	27.31	26.90	29.33	29.90	8.00	31.00	-*	-*	22.43	23.40	25.23	26.73	27.51
South Sanpete	22.50	23.40	26.25	21.60	23.33	25.00	24.30	24.60	25.22	28.14	25.00	28.25	30.29	28.75	32.00	25.00	34.50	27.00	24.67	-*	26.00	-*	24.00	-*	24.85	26.07	27.08
South Summit	37.50	20.00	17.75	30.67	24.33	20.67	23.67	20.50	27.33	30.00	22.67	28.00	24.50	22.25	23.00	-*	23.33	22.50	-*	-*	-*	-*	-*	-*	29.00	22.00	22.90
Tintic	11.00	-*	-*	23.00	-*	-*	12.00	-*	-*	14.00	-*	-*	14.00	-*	-*	21.00	-*	-*	18.00	-*	-*	-*	-*	-*	16.14	-*	-*
Tooele	25.18	23.29	25.45	22.20	25.39	23.20	24.73	24.14	23.58	23.52	25.83	25.57	26.24	26.68	25.85	29.46	27.00	27.00	28.40	28.85	27.79	20.25	26.22	20.33	24.88	25.65	25.01
Uintah	25.84	23.24	22.89	25.55	24.55	25.00	28.26	24.39	27.78	28.21	27.68	25.42	29.70	27.31	26.50	29.00	27.53	26.00	28.67	27.00	28.75	-*	-*	17.17	27.05	25.71	25.26
Wasatch	-*	23.00	24.60	21.69	28.33	36.43	23.50	28.25	38.80	25.50	31.38	36.33	26.71	27.67	30.67	26.57	30.63	36.57	30.50	-*	-*	14.50	20.00	30.50	24.07	27.85	32.88
Washington	27.91	26.53	27.86	26.31	25.34	28.42	26.89	28.28	29.64	28.67	28.13	30.97	29.24	28.04	29.82	27.71	29.87	31.43	29.00	34.40	33.00	25.00	21.00	36.18	27.72	28.09	30.22
Wayne	20.67	18.00	27.00	21.00	25.50	22.00	20.00	25.00	25.50	18.33	22.50	21.00	21.50	18.00	23.50	18.67	27.50	34.00	21.00	-*	-*	-*	18.00	-*	20.15	21.80	24.50
Weber	25.09	25.47	25.83	24.68	25.86	25.17	24.09	24.70	24.48	25.26	25.60	25.48	26.04	27.48	28.36	26.66	28.00	27.68	26.13	27.73	27.97	26.00	23.00	26.55	25.37	26.29	26.33
Salt Lake City	26.14	25.81	25.47	25.46	25.03	25.52	25.80	25.62	25.84	25.94	25.33	26.07	28.47	30.27	30.09	28.78	29.52	29.27	29.68	30.71	29.94	22.65	27.46	22.12	26.59	27.01	26.54
Ogden	26.20	25.39	24.15	24.02	23.64	23.69	23.28	24.02	23.66	24.29	23.76	23.15	25.11	25.00	24.58	26.07	27.03	24.38	-*	-*	-*	21.38	22.63	20.00	24.67	24.66	23.74
Provo	26.95	26.59	26.04	25.87	25.53	25.73	28.50	26.98	26.59	29.41	28.41	28.74	30.76	29.97	32.00	30.56	32.43	30.87	27.96	30.76	32.19	31.90	30.71	20.15	28.43	28.28	28.06
Logan	26.75	25.25	27.38	26.33	24.45	25.00	27.56	24.06	23.94	27.47	27.29	29.00	26.54	27.93	28.36	29.25	32.18	29.77	-*	-*	-*	24.00	-*	10.00	27.17	26.33	26.73
Murray	25.76	26.27	26.50	26.63	25.90	25.50	27.53	26.16	24.69	28.50	30.13	26.75	28.20	27.53	25.00	27.00	27.80	26.86	24.06	29.13	27.33	26.00	24.25	13.93	26.70	27.27	24.65
State Average	26.07	25.87	26.07	25.25	25.58	25.44	25.57	26.02	26.21	26.69	26.99	27.44	28.32	28.77	28.76	28.26	29.41	29.20	28.42	29.61	29.75	25.18	26.68	25.37	26.65	27.13	27.14

* Insufficient information.

APPENDIX E1

APPENDIX E2

UEA ELEMENTARY CLASS SIZE SURVEY

TABLE 2

KINDERGARTEN

GROUPING BY NUMBER OF STUDENTS	WASATCH FRONT	NON-WASATCH FRONT	STATE TOTAL
0-14 students	5	9	14
15-19 students	21	18	39
20-24 students	288	80	368
25-29 students	562	126	688
30-34 students	165	45	210
35-39 students	13	2	15
40-44 students	0	1	1
45+ students	0	0	0
TOTAL	1,054	281	1,335
ALL CLASSES	26.23	25.48	26.07

TABLE 3

FIRST GRADE

GROUPING BY NUMBER OF STUDENTS	WASATCH FRONT	NON-WASATCH FRONT	STATE TOTAL
0-14 students	4	8	12
15-19 students	27	21	48
20-24 students	366	98	464
25-29 students	567	137	704
30-34 students	97	32	129
35-39 students	9	2	11
40-44 students	0	4	4
45+ students	0	1	1
TOTAL	1,070	303	1,373
ALL CLASSES	25.50	25.24	25.44

TABLE 4

SECOND GRADE

GROUPING BY NUMBER OF STUDENTS	WASATCH FRONT	NON-WASATCH FRONT	STATE TOTAL
0-14 students	0	3	3
15-19 students	12	10	22
20-24 students	259	102	361
25-29 students	614	114	728
30-34 students	139	53	192
35-39 students	5	2	7
40-44 students	0	2	2
45+ students	0	2	2
TOTAL	1,029	288	1,317
ALL CLASSES	26.28	25.98	26.21

***For purposes of this publication, "Wasatch Front" is comprised of the following school districts: Alpine, Box Elder, Davis, Granite, Jordan, Nebo, Tooele, Weber, Salt Lake, Ogden, Provo and Murray.**

APPENDIX E3

TABLE 5

THIRD GRADE

GROUPING BY NUMBER OF STUDENTS	WASATCH FRONT	NON-WASATCH FRONT	STATE TOTAL
0-14 students	4	4	8
15-19 students	5	6	11
20-24 students	133	52	185
25-29 students	557	126	683
30-34 students	227	65	292
35-39 students	19	6	25
40-44 students	0	1	1
45+ students	0	3	3
TOTAL	945	263	1,208
ALL CLASSES	27.51	27.20	27.44

TABLE 6

FOURTH GRADE

GROUPING BY NUMBER OF STUDENTS	WASATCH FRONT	NON-WASATCH FRONT	STATE TOTAL
0-14 students	2	2	4
15-19 students	2	5	7
20-24 students	75	40	115
25-29 students	355	99	454
30-34 students	304	64	368
35-39 students	49	11	60
40-44 students	3	2	5
45+ students	0	1	1
TOTAL	790	224	1,014
ALL CLASSES	28.99	27.92	28.76

TABLE 7

FIFTH GRADE

GROUPING BY NUMBER OF STUDENTS	WASATCH FRONT	NON-WASATCH FRONT	STATE TOTAL
0-14 students	5	1	6
15-19 students	5	3	8
20-24 students	48	37	86
25-29 students	326	91	419
30-34 students	378	67	445
35-39 students	26	9	35
40-44 students	3	5	8
45+ students	1	3	4
TOTAL	792	216	1,011
ALL CLASSES	29.42	28.42	29.20

APPENDIX E4

TABLE 8

SIXTH GRADE

GROUPING BY NUMBER OF STUDENTS	WASATCH FRONT	NON-WASATCH FRONT	STATE TOTAL
0-14 students	5	4	9
15-19 students	8	2	10
20-24 students	31	15	46
25-29 students	267	15	282
30-34 students	297	26	323
35-39 students	69	4	73
40-44 students	10	3	13
45+ students	0	0	0
TOTAL	687	69	756
ALL CLASSES	29.95	27.72	29.75

TABLE 9

COMBINATION CLASSES

GROUPING BY NUMBER OF STUDENTS	WASATCH FRONT	NON-WASATCH FRONT	STATE TOTAL
0-14 students	80	24	104
15-19 students	21	10	31
20-24 students	80	24	104
25-29 students	133	24	157
30-34 students	114	13	127
35-39 students	25	8	33
40-44 students	21	6	27
45+ students	16	0	16
TOTAL	490	109	599
ALL CLASSES	25.86	23.18	25.37

TABLE 10

ALL CLASSES

GROUPING BY NUMBER OF STUDENTS	WASATCH FRONT	NON-WASATCH FRONT	STATE TOTAL
0-14 students	105	55	160
15-19 students	101	75	176
20-24 students	1,281	448	1,729
25-29 students	3,383	732	4,115
30-34 students	1,724	365	2,089
35-39 students	215	44	259
40-44 students	37	24	61
45+ students	17	10	27
TOTAL	6,863	1,753	8,616
ALL CLASSES	27.33	26.40	27.14

APPENDIX E5

TABLE 11

UEA MIDDLE, INTERMEDIATE AND JUNIOR HIGH CLASS SIZE SURVEY

1986-1987 Comparisons

CLASS TYPE	SIZE OF CLASS												AVERAGE	
	0-9		10-19		20-29		30-39		40-49		50+			
	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987
ENGLISH	16	18	220	238	1387	1652	1406	1667	12	13	0	0	28.2	28.4
FOREIGN LANGUAGE	2	1	55	75	297	345	315	408	12	12	0	0	28.6	28.7
MATH	14	9	165	210	928	1138	963	1198	25	36	0	2	28.3	28.5
SCIENCE	8	3	63	57	557	706	734	977	7	14	0	0	29.3	29.7
SOCIAL SCIENCE	8	8	68	78	659	804	957	1203	13	20	0	0	29.5	29.8
COMPUTER SCIENCE	5	0	44	43	133	137	76	95	6	4	0	0	25.6	26.6
ART	1	4	54	51	282	321	229	296	10	5	0	1	27.5	28.1
BUSINESS	1	2	17	19	87	101	190	222	57	74	0	0	32.9	32.7
CRAFTS & VOC.	8	4	134	132	473	549	107	145	3	2	0	0	24.0	24.6
HEALTH	0	0	33	23	126	142	185	243	3	12	1	5	29.0	30.2
HOME ECONOMICS	2	3	88	93	399	420	104	131	2	3	0	1	24.7	25.2
PHYSICAL EDUCATION	2	4	33	31	172	223	406	519	358	448	174	146	38.9	38.0
DRIVER EDUCATION	0	0	3	0	3	1	3	0	1	0	3	0	34.0	23.0
MUSIC	14	10	91	91	196	218	221	244	128	165	146	170	35.8	36.7
MISC.	*	3	*	10	*	38	*	13	*	1	*	0	*.*	24.3
RESOURCE SP. ED.	*	17	*	25	*	2	*	1	*	0	*	0	*.*	12.2
OTHER	*	17	*	39	*	191	*	109	*	4	*	3	*.*	26.1
TOTAL	**81**	**105**	**1068**	**1215**	**5699**	**6988**	**5896**	**7471**	**637**	**813**	**324**	**328**	**29.5**	**29.6**

***No comparison for 1986**

APPENDIX E6

TABLE 12

UEA HIGH SCHOOL CLASS SIZE SURVEY

1986-1987 Comparisons

CLASS TYPE	SIZE OF CLASS 0-9		10-19		20-29		30-39		40-49		50+		AVERAGE	
	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987
ENGLISH	54	67	368	375	1002	994	979	995	75	76	5	3	27.4	27.0
FOREIGN LANGUAGE	26	42	112	193	309	306	316	268	22	14	0	0	27.0	24.7
MATH	30	48	251	254	676	664	706	752	61	55	1	3	27.4	27.4
SCIENCE	19	39	190	181	545	532	646	665	36	56	1	0	27.8	27.9
SOCIAL SCIENCE	17	22	186	181	569	568	825	895	87	118	0	0	29.0	29.5
COMPUTER SCIENCE	13	10	71	57	116	86	46	41	0	3	0	0	22.5	22.6
ART	4	14	73	71	249	244	192	188	7	10	0	0	26.9	26.4
BUSINESS	46	49	184	182	357	406	302	344	36	42	8	8	25.8	26.1
CRAFTS & VOC.	91	112	471	506	587	543	143	122	2	4	0	1	20.6	19.9
HEALTH	3	3	35	32	102	113	170	143	21	11	1	1	29.8	29.1
HOME ECONOMICS	25	32	184	158	332	293	219	217	11	15	0	0	24.6	24.8
PHYSICAL EDUCATION	17	19	130	146	336	315	337	351	203	160	93	82	32.7	31.6
DRIVER EDUCATION	1	7	21	11	61	41	101	77	18	23	6	8	31.2	31.9
MUSIC	26	17	89	94	108	116	50	79	51	52	87	95	35.8	36.0
MISC.	*	28	*	19	*	10	*	7	*	1	*	0	*.*	14.7
RESOURCE SP. ED.	*	19	*	30	*	11	*	0	*	0	*	0	*.*	12.3
OTHER	*	95	*	156	*	121	*	109	*	13	*	14	*.*	21.4
TOTAL	**372**	**623**	**2365**	**2646**	**5349**	**5363**	**5032**	**5253**	**630**	**653**	**202**	**215**	**27.4**	**26.8**

***No comparison for 1986**

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* These resources are available through the Utah State Office Research Library